This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

No. .....

BOSTON

MEDICAL LIBRARY,

19 BOYLSTON PLACE.

TRANSACTIONS

OF THE

AMERICAN

OPHTHALMOLOGICAL SOCIETY.

Thirty-Third Annual Meeting.

WASHINGTON, D. C., 1897.

HARTFORD:
PUBLISHED BY THE SOCIETY.
1897.

1754

PRESS OF
THE CASE, LOCKWOOD & BRAINARD CO.
HARTFORD, CONN.

BOSTON MEDICAL
FEB 2 1900
LIBRARY.
5220

TABLE OF CONTENTS.

	PAGE.
List of members,	5
Minutes of Proceedings,	9
A case of Exophthalmic Goitre in which, owing to panophthalmitis, the enucleation of both eyes in succession became imperative. Dr. J. A. Spalding,	15
A case of Exophthalmic Goitre following ether anesthesia. Dr. Wm. F. Aiken,	20
Report of cases of pulsating Exophthalmos. Dr. W. H. Wilder,	23
Double Exophthalmos with ulcerative destruction of the eyes in an infant from sarcoma of dura mater. Dr. S. M. Burnett,	31
Pathology of chronic membranous Conjunctivitis. Dr. L. Howe,	36
Diphtheritic Conjunctivitis. Dr. Myles Standish,	44
Credé's method for the prevention of purulent ophthalmia of infancy in public institutions. Dr. L. Howe,	52
Report on a new operation for Prothesis in cases of cicatricial orbit. Dr. G. C. Harlan,	63
An Ivory Exostosis of the orbit. Dr. W. F. Norris,	67
Supplementary report of a case of Ivory Exostosis of the orbit. Dr. R. Sattler,	70
Intra-ocular Enchondroma springing from the choroid. Dr. E. Jackson,	72
Angio-sarcoma of apparent retinal origin. Dr. W. B. Johnson,	76
Removal of a piece of iron imbedded in the crystalline lens. Dr. Wm. Thomson,	83
The value of repeated and differently-placed exposures to the Roentgen ray in determining the location of foreign bodies in and about the eyeball. Dr. C. A. Oliver,	90
Removal of piece of steel located by X-rays from interior of eyeball. Dr. Wm. Thomson,	93
Congenital Epicanthus and Ptosis. Dr. R. Sattler,	96
Operation for Ptosis. Dr. W. H. Wilder,	99
Resection and advancement of the levator palpebrae muscle in traumatic ptosis,	103
Trophic Keratitis with a case occurring in caisson disease. Dr. G. C. Harlan,	107
Law of refraction-change following increase or decrease of body-weight. Dr. C. M. Gould,	115

PAGE.

The desirability of a Periscopic quality in correcting lenses. Dr. C. M. Culver, ... 119

A new achromatic glass for cataract for far vision and a bifocal combination for far and near use. Dr. Wm. Thomson. . . 120

Two cases of marked and rapid change in refraction in patients suffering from Glycosuria, associated with variation in the amount of sugar secreted in the urine. Dr. S. D. Risley, . 121

A series of consecutive Cataract operations. Dr. R. L. Randolph, . 126

Hemorrhage attending the extraction of Cataract. Dr. O. F. Wadsworth, ... 136

Cholesterine crystals in the opaque lens of a child. Dr. L. A. W. Alleman, ... 142

Removal of a piece of steel from the vitreous chamber, the position of the foreign body being determined by the presence of a scotoma in the field of vision. Dr. C. A. Oliver, . . . 154

Taxis in increased intra-ocular tension. Dr. S. O. Richey, . . 156

Retinitis Proliferans. Dr. J. E. Weeks, ... 158

A case of Retinitis Circinata. Dr. E. Fridenberg, ... 181

Completion of the history of a case of Tumor of the Intervaginal space of the optic nerve-sheath reported in these Transactions for 1894. Dr. S. M. Burnett, ... 185

A case of Toxic Amblyopia with autopsy and microscopical examination of the specimens. Dr. G. E. de Schweinitz, . . . 186

Marked impairment of central vision following prolonged use of the affected eye. Dr. S. Theobald, ... 198

Hysterical or functional blindness. Dr. A. A. Hubbell, . . . 200

A group of four cases of optic nerve atrophy with nearly total blindness following sexual excesses. Dr. J. A. Spalding, . 206

A study of the ophthalmic changes in Chlorosis, Pernicious Anæmia, and Leucocythæmia. Dr. C. A. Oliver, ... 212

Standards of form and color-vision required in railway service. Dr. C. H. Williams, ... 227

So-called accommodation in a lensless eye, with report of a case. Dr. J. A. White, ... 241

MEMBERS

OF THE

AMERICAN OPHTHALMOLOGICAL SOCIETY,

1897-98.

ACTIVE MEMBERS.

The (*) indicates *Associate* Members.

NAME.	RESIDENCE.	PLACE.
DR. F. W. ABBOT,	523 Franklin Street,	Buffalo, N. Y.
*Dr. A. E. ADAMS,	44 Grand Street,	Newburg, N. Y.,
Dr. WM. F. AIKEN,	228 Oglethorpe Ave. E.	Savannah, Ga.
Dr. L. A. W. ALLEMAN,	64 Montague Street,	Brooklyn, N. Y.
Dr. HARLAN P. ALLEN,	73 East State Street,	Columbus, Ohio.
*Dr. G. W. ALLYN,	515 Penn Avenue,	Pittsburg, Pa.
Dr. A. ALT,	3036 Locust Street,	St. Louis, Mo.
Dr. J. A. ANDREWS,	9 W. 22d Street,	New York, N. Y.
Dr. S. C. AYRES,	64 West 7th Street,	Cincinnati, Ohio.
Dr. WM. T. BACON,	3 Pratt Street,	Hartford, Conn.
Dr. B. J. BALDWIN,	13 South Perry Street,	Montgomery, Ala.
Dr. EDWIN W. BARTLETT,	420 Jefferson Street,	Milwaukee, Wis.
Dr. DAVID DEBECK,	cor. 9th and Race Streets,	Cincinnati, Ohio.
Dr. H. W. BRADFORD,	6 Beacon Street,	Boston, Mass.
Dr. CHARLES S. BULL,	47 West 36th Street,	New York, N. Y.
Dr. F. BULLER,	123 Stanley Street,	Montreal, Canada.
Dr. SWAN M. BURNETT,	916 Farragut Sq. (17th St.),	Washington, D. C.
Dr. PETER A. CALLAN,	35 West 38th Street,	New York, N. Y.
Dr. F. P. CAPRON,	203 Washington Street,	Providence, R. I.
Dr. W. H. CARMALT,	87 Elm Street,	New Haven, Conn.
Dr. H. B. CHANDLER,	34½ Beacon Street,	Boston, Mass.
Dr. WM. CHEATHAM,	303 West Chestnut Street,	Louisville, Ky.
Dr. F. E. CHENEY,	Hotel Bristol,	Boston, Mass.
Dr. C. F. CLARK,	188 East State Street,	Columbus, Ohio.
Dr. DAVID COGGIN,	7 Chestnut Street,	Salem, Mass.
*Dr. WM. E. COWEN,	35 E. 60th Street,	New York, N. Y.
Dr. C. M. CULVER,	36 Eagle Street,	Albany, N. Y.
Dr. W. S. DENNETT,	8 East 49th Street,	New York, N. Y.
Dr. HASKET DERBY,	182 Marlboro Street,	Boston, Mass.
Dr. RICHARD H. DERBY,	9 West 35th Street,	New York, N. Y.
Dr. LEWIS S. DIXON,	232 Clarendon Street,	Boston, Mass.
Dr. J. B. EMERSON,	20 East 30th Street,	New York, N. Y.
Dr. ARTHUR E. EWING,	2670 Washington Avenue,	St. Louis, Mo.
*Dr. T. H. FENTON,	1319 Spruce Street,	Philadelphia, Pa.
Dr. GEORGE F. FISKE,	100 State Street,	Chicago, Ill.
Dr. EDW. FRIDENBERG,	242 Lenox Avenue,	New York, N. Y.
Dr. H. FRIEDENWALD,	1029 Madison Ave.,	Baltimore, Md.

NAME.	RESIDENCE.	PLACE.
Dr. B. F. FRYER,	cor. 9th and Cherry Streets,	Kansas City, Mo.
*Dr. J. B. GIBSON,	215 E. Pike's Peak Ave.,	Colorado Springs, Col.
*Dr. G. M. GOULD,	119 South 17th Street,	Philadelphia, Pa.
*Dr. H. Y. GRANT,	414 Delaware Avenue,	Buffalo, N. Y.
Dr. JOHN GREEN,	2670 Washington Avenue,	St. Louis, Mo.
Dr. EMIL GRUENING,	109 East 23d Street,	New York, N. Y.
Dr. G. W. HALE,	Wilcox Building,	Nashville, Tenn.
*Dr. WM. D. HALL,	387 Boylston Street,	Boston, Mass.
Dr. H. F. HANSELL,	254 South 16th Street,	Philadelphia, Pa.
Dr. GEORGE C. HARLAN,	1515 Walnut Street,	Philadelphia, Pa.
Dr. DAVID HARROWER,	9 Elm Street,	Worcester, Mass.
*Dr. N. D. HARVEY,	360 Benefit Street,	Providence, R. I.
Dr. GUSTAVUS HAY,	383 Marlborough Street,	Boston, Mass.
Dr. NEIL J. HEPBURN,	369 West 23d Street,	New York, N. Y.
*Dr. WARD HOLDEN,	45 West 39th Street,	New York, N. Y.
Dr. EDWARD L. HOLMES,	31 Washington Street,	Chicago, Ill.
Dr. E. E. HORT,	723 Congress Street,	Portland, Me.
Dr. LUCIEN HOWE,	87 West Huron Street,	Buffalo, N. Y.
*Dr. A. A. HUBBELL,	212 Franklin Street,	Buffalo, N. Y.
Dr. D. W. HUNTER,	233 Madison Avenue,	New York, N. Y.
*Dr. E. E. JACK,	215 Beacon Street,	Boston, Mass.
Dr. EDWARD JACKSON,	1633 Locust Street,	Philadelphia, Pa.
Dr. B. JOY JEFFRIES,	15 Chestnut St., Beacon Hill,	Boston, Mass.
Dr. W. B. JOHNSON,	170 Broadway,	Paterson, N. J.
Dr. SAMUEL J. JONES,	115 Monroe Street,	Chicago, Ill.
Dr. CHARLES J. KIPP,	534 Broad Street,	Newark, N. J.
Dr. H. KNAPP,	26 West 40th Street,	New York, N. Y.
Dr. CARL KOLLER,	715 Madison Avenue,	New York, N. Y.
Dr. CHAS. W. KOLLOCK,	cor. Wentw'th & Com'g Sts.,	Charleston, S. C.
Dr. W. E. LAMBERT,	8 West 35th Street,	New York, N. Y.
Dr. J. A. LIPPINCOTT,	435 Penn Avenue,	Pittsburg, Pa.
Dr. F. B. LORING,	1420 K Street,	Washington, D. C.
Dr. F. W. MARLOW,	401 Montgomery Street,	Syracuse, N. Y.
Dr. W. V. MARMION,	1108 F Street,	Washington, D. C.
*Dr. W. B. MARPLE,	20 W. 31st Street,	New York, N. Y.
Dr. ARTHUR MATHEWSON,	139 Montague Street,	Brooklyn, N. Y.
Dr. S. F. MCFARLAND,	76 Front Street,	Binghamton, N. Y.
Dr. CHAS. H. MCILWAINE,	107 South Warren Street,	Trenton, N. J.
Dr. R. J. MCKAY,	cor. 9th and Market Streets,	Wilmington, Del.
Dr. C. S. MERRILL,	22 Washington Avenue,	Albany, N. Y.
Dr. B. L. MILLIKIN,	278 Prospect Street,	Cleveland, Ohio.
Dr. H. G. MILLER,	262 Benefit Street,	Providence, R. I.
Dr. J. LANCELOT MINOR,	cor. Main and Beale Sts.,	Memphis, Tenn.
Dr. W. F. MITTENDORF,	140 Madison Avenue,	New York, N. Y.
Dr. WM. O. MOORE,	42 East 29th Street,	New York, N. Y.
Dr. RUSSELL MURDOCH,	418 Cathedral Street,	Baltimore, Md.
Dr. WM. F. NORRIS,	1530 Locust Street,	Philadelphia, Pa.
Dr. HENRY D. NOYES,	233 Madison Avenue,	New York, N. Y.
Dr. CHARLES A. OLIVER,	1507 Locust Street,	Philadelphia, Pa.
Dr. H. S. OPPENHEIMER,	49 East 23d Street,	New York, N. Y.
*Dr. R. J. PHILLIPS,	4011 Chestnut Street,	Philadelphia, Pa.
Dr. THOMAS R. POOLEY,	107 Madison Avenue,	New York, N. Y.

NAME.	RESIDENCE.	PLACE.
Dr. M. H. POST,	Beaum't St., cor. Wash. Av.,	St. Louis, Mo.
*Dr. H. R. PRICE,	485 Franklin Avenue,	Brooklyn, N. Y.
Dr. J. S. PROUT,	26 Schermerhorn Street,	Brooklyn, N. Y.
Dr. B. ALEX'R RANDALL,	1806 Chestnut Street,	Philadelphia, Pa.
Dr. R. L. RANDOLPH,	211 W. Madison Street,	Baltimore, Md.
Dr. WILLIAM RANKIN,	23 Cedar Street,	Newark, N. J.
Dr. J. M. RAY,	423 West Chestnut Street,	Louisville, Ky.
Dr. R. A. REEVE,	22 Shuter Street,	Toronto, Canada.
Dr. STEPHEN O. RICHEY,	732 17th Street,	Washington, D. C.
Dr. CHARLES E. RIDER,	53 South Fitzhugh Street,	Rochester, N. Y.
Dr. WHEELOCK RIDER,	53 South Fitzhugh Street,	Rochester, N. Y.
*Dr. H. W. RING,	46 Elm Street,	New Haven, Conn.
Dr. SAMUEL D. RISLEY,	1722 Walnut Street,	Philadelphia, Pa.
Dr. EDMUND C. RIVERS,	16th and Stout Streets,	Denver City, Col.
Dr. D. B. ST. JOHN ROOSA,	20 East 30th Street,	New York, N. Y.
Dr. JOHN D. RUSHMORE,	129 Montague Street,	Brooklyn, N. Y.
Dr. ROBERT SATTLER,	14 East 7th Street,	Cincinnati, Ohio.
Dr. G. E. DESCHWEINITZ,	1401 Locust Street,	Philadelphia, Pa.
*Dr. P. N. K. SCHWENK,	810 North 7th Street,	Philadelphia, Pa.
Dr. W. W. SEELEY,	S. E. cor. 4th St. and B'dway,	Cincinnati, Ohio.
Dr. HENRY L. SHAW,	19 Commonwealth Avenue,	Boston, Mass.
*Dr. F. D. SKEEL,	41 E. 23d Street,	New York, N. Y.
Dr. J. A. SPALDING,	627 Congress Street,	Portland, Me.
Dr. FRANCIS P. SPRAGUE,	229 Commonwealth Avenue,	Boston, Mass.
Dr. MYLES STANDISH,	6 St. James Avenue,	Boston, Mass.
Dr. GEORGE T. STEVENS,	33 West 33d Street,	New York, N. Y.
Dr. SAMUEL B. ST. JOHN,	26 Pratt Street,	Hartford, Conn.
Dr. GEO. STRAWBRIDGE,	1500 Walnut Street,	Philadelphia, Pa.
Dr. T. Y. SUTPHEN,	999 Broad Street,	Newark, N. J.
Dr. J. OSCROFT TANSLEY,	28 West 43d Street,	New York, N. Y.
Dr. LEWIS H. TAYLOR,	41 South Franklin Street,	Wilkes Barre, Pa.
Dr. SAMUEL THEOBALD,	304 West Monument Street,	Baltimore, Md.
Dr. CH. HERMON THOMAS,	1633 Locust Street,	Philadelphia, Pa.
Dr. WILLIAM THOMSON,	1426 Walnut Street,	Philadelphia, Pa.
Dr. JOHN VAN DUYN,	111 South Salina Street,	Syracuse, N. Y.
Dr. J. J. B. VERMYNE,	2 Orchard Street,	New Bedford, Mass.
Dr. O. F. WADSWORTH,	526 Beacon Street,	Boston, Mass.
Dr. LEROY P. WALKER,	25 East 24th Street,	New York, N. Y.
Dr. JAMES WALLACE,	121 North 16th Street,	Philadelphia, Pa.
Dr. DAVID WEBSTER,	327 Madison Avenue,	New York, N. Y.
Dr. J. E. WEEKS,	154 Madison Avenue,	New York, N. Y.
Dr. J. A. WHITE,	200 E. Franklin Street,	Richmond, Va.
*Dr. W. H. WILDER,	103 State Street,	Chicago, Ill.
Dr. CHAS. H. WILLIAMS,	15 Arlington Street,	Boston, Mass.
Dr. WM. H. WILMER,	1330 N. York Ave., N. W.,	Washington, D. C.
Dr. F. M. WILSON,	317 State Street,	Bridgeport, Conn.
Dr. J. P. WORRELL,	20 South 7th Street,	Terre Haute, Ind.
Total, ...		136.

HONORARY MEMBER.

Dr. C. SCHWEIGGER, ...	Berlin, Prussia.
Whole Number, ...	137.

MINUTES OF THE PROCEEDINGS.

THIRTY-THIRD ANNUAL MEETING.

ARLINGTON HOTEL,
WASHINGTON, D. C., MAY 5, 1897.

The Thirty-third Annual Meeting of the Society held in connection with the Fourth Congress of American Physicians and Surgeons at Washington, D. C., was called to order by the President, Dr. GEORGE C. HARLAN, at 10 A. M., and the following committees were appointed:

Committee on Bulletin — Drs. C. A. OLIVER and MYLES STANDISH.

Committee on Membership — Drs. JOHN GREEN, C. S. BULL, SAMUEL THEOBALD, and ARTHUR MATHEWSON.

Auditing Committee — Dr. S. O. RICHEY.

The following-named guests, were, by vote of the Society, invited to attend the meeting: Dr. A. H. Knapp, New York; Dr. A. A. Schloss, Stockton, Cal.; Dr. W. N. Souter, Springfield, Mass.; Dr. E. O. Belt, Washington; Dr. W. M. Sweet, Philadelphia; Dr. S. H. Dixon, U. S. N.; Dr. J. T. Carpenter, Philadelphia; Dr. W. B. Moulton, Portland, Me.; Dr. W. P. Eagleton, Newark, N. J.; Dr. M. E. Hennessy, New York; Dr. Muncaster, Washington; Dr. T. R. French, New York; and Dr. A. G. Thompson, Philadelphia.

The Bulletin Committee reported, and the following papers were read:

1. "Enucleation of both eyes owing to Panophthalmitis in a case of Exophthalmic Goitre," by Dr. J. A. Spalding.

2. "A case of Exophthalmic Goitre following Ether anæsthesia," by Dr. Wm. F. Aiken.

3. "Report of cases of pulsating exophthalmos," by Dr. W. H. Wilder.

4. "Double exophthalmos with destruction of the eyes in an infant, starting probably from the dura near the sella turcica" (autopsy), by Dr. S. M. Burnett. Discussed by Dr. J. O. Tansley.

5. "Pathology of chronic pseudo-membranous conjunctivitis," with presentation of patient, by Dr. L. Howe.

6. "Diphtheritic conjunctivitis," by Dr. Myles Standish. Discussed by Drs. deSchweinitz, Weeks, and Howe.

7. "Why Ophthalmic Societies should approve the Credé method for the prevention of ophthalmia neonatorum," by Dr. L. Howe (by title).

8. "A new operation for Prothesis in cases of cicatricial orbit," by Dr. G. C. Harlan.

9. "A case of ivory exostosis of the orbit," by Dr. W. F. Norris.

10. "A supplementary report of a case of ivory exostosis of the orbit," by Dr. R. Sattler.

11. "A unique intra-ocular tumor," by Dr. E. Jackson.

12. "Angio-Sarcoma of apparent retinal origin," by Dr. W. B. Johnson.

Discussion of papers 8–12 by Drs. Sattler, Norris, Weeks, Howe, and Risley.

13. "Two cases of removal of steel from the eyeball located by the Roentgen rays, one imbedded in the crystalline lens," by Dr. Wm. Thomson, with demonstration of the locating process by Dr. W. M. Sweet.

14. "Value of repeated and differently placed exposures to the Roentgen ray in determining the location of foreign bodies in and about the eyeball," by Dr. C. A. Oliver.

The Society then went into executive session.

The Committee on Membership reported favorably on three of the names referred to them, but on account of the limited attendance at the executive session, it was voted not to ballot upon these names until next year. The Committee also offered a list of candidates which it recommended should be referred to the Committee of Membership for next year. So ordered.

The Nominating Committee reported the following list of officers for the ensuing year, who were elected:

President, Dr. GEORGE C. HARLAN.

Vice-President, Dr. O. F. WADSWORTH.

Corresponding Secretary, Dr. J. S. PROUT.

Recording Secretary and Treasurer, Dr. S. B. ST. JOHN.

Publication Committee, Drs. W. S. DENNETT, R. H. DERBY, and S. B. ST. JOHN.

Voted, That the next place of meeting be New London.

Voted, That the assessment of next year be five dollars.

Voted, That the President appoint a delegate to represent the Society at the meeting of the British Medical Society at Montreal in August, 1897, and Dr. S. B. ST. JOHN was subsequently appointed.

Dr. Howe of Buffalo offered the following resolution:

WHEREAS, Purulent ophthalmia of infancy produces more blindness than any other disease, thus necessitating great and often unnecessary cost to the state with life-long misery to the individual, and

WHEREAS, A two per cent. solution of silver nitrate dropped into the eyes of children as soon as possible after birth, is one of the most efficient means for preventing that disease, therefore

Resolved, That we desire to call the attention of obstetricians to the fact that these cases are unfortunately common in our practice, and to urge the more frequent use of the silver nitrate solution in the manner described by Credé.

Resolved, That we approve of the legislation which would result in the invariable use of this method or of any other equally safe and efficient, whereby the loss of vision from this disease would be lessened.

After discussion the Society voted to appoint a committee of three to report upon the subject at the next annual meeting, and Drs. JACKSON, HOWE, and BURNETT were appointed.

Voted, To accept the resignation of Dr. A. D. HALL.

Adjourned to meet at 9 A. M., on May 6th.

MAY 6, 1897.

Society called to order at 9.15 A.M., and reading of papers was resumed.

15. "Endothelioma of lower lid," by Dr. C. H. Williams.

16. "Congenital Ptosis and Epicanthus," by Dr. R. Sattler.

17. "A new operation for Ptosis." Dr. W. H. Wilder.

18. "Resection and advancement of the levator-palpebræ muscle in traumatic ptosis," by Dr. C. A. Oliver. Discussion by Drs. Fridenburg, Tansley, Wilder, and Sattler.

19. "Trophic Keratitis," by Dr. Geo. C. Harlan (title).

20. "Law of refraction-change following increase or decrease of body-weight," by Dr. G. M. Gould.

21. "The desirability of a Periscopic quality in correcting lenses," by Dr. C. M. Culver.

22. "Exhibition of cataract glasses, bifocal and achromatic," by Dr. William Thomson.

23. "Two cases of saccharine diabetes with rapid and remarkable changes in the refraction without demonstrable change in the transparency of the lens," by Dr. S. D. Risley. Discussion by Drs. Fridenburg, Theobald, Wadsworth, Gould, and Risley.

24. "A series of consecutive cataract operations," by Dr. R. L. Randolph.

25. "Hemorrhage during or following cataract operation," by Dr. O. F. Wadsworth.

26. "Cholesterine crystals in the opaque lens of a child," by Dr. L. A. W. Alleman. Discussion of papers 24–26 by Drs. Ring, Howe, Risley, Randolph, St. John, Reeve, Webster, Holt, Theobald, Green, Weeks, Williams, Ray, Buller, Wadsworth, Wilson, and White.

27. "Removal of steel from vitreous, the position of the foreign body being determined by the presence of a scotoma in the field of vision," by Dr. C. A. Oliver.

28. "Taxis in increased intra-ocular tension," by Dr. S. O. Richey.

29. "Retinitis Proliferans," by Dr. J. E. Weeks.

30. "A Case of retinitis circinata," by Dr. E. Fridenburg.

31. "Additional note on case of tumor of the optic nerve," by Dr. S. M. Burnett (title).

32. "Tobacco-amblyopia with autopsy and microscopic examination of the specimens," by Dr. G. E. deSchweinitz.

33. "Marked impairment of central vision following prolonged use of the affected eye," by Dr. S. Theobald.

34. "Hysterical or functional blindness," by Dr. A. A. Hubbell.

35. "A Case of mental disease in which amnesic aphasia and agraphia were prominent symptoms," by Dr. H. F. Hansell (title).

36. "A Group of four cases of optic atrophy due to sexual excess," by Dr. J. A. Spalding.

37. "A study of some of the ophthalmic changes in chlorosis, pernicious anæmia, and leucocythæmia," by Dr. C. A. Oliver.

38. "Exhibition of water-color sketch of case of embolism of central artery of retina, the region between the macula and the disc appearing normal," by Dr. John Green.

39. "Demonstration of Reed's ophthalmometer," by Dr. R. Murdoch.

40. "An improved form of axometer," by Dr. C. H. Williams.

41. "An electro-magnet," by Dr. John Green.

42. "What standards of form and color vision should be required in railway service," by Dr. C. H. Williams.

43. "So-called accommodation in a lensless eye," by Dr. J. A. White (title).

Adjourned.

S. B. ST. JOHN, *Secretary.*

Members present at the thirty-third annual meeting of the American Ophthalmological Society:

Dr. S. B. ST. JOHN,
GEORGE T. STEVENS,
ROBERT SATTLER,
C. M. CULVER,
JAMES A. SPALDING,
GEORGE C. HARLAN,
G. E. DE SCHWEINITZ,
*R. J. PHILLIPS,
*GEORGE M. GOULD,
WILLIAM F. AIKEN,
R. A. REEVE,
Dr.*P. N. K. SCHWENK,
FRANCIS B. LORING,
JOHN GREEN,
J. OSCROFT TANSLEY,
NEIL J. HEPBURN,
L. A. W. ALLEMAN,
ARTHUR MATTHEWSON,
J. M. RAY,
PETER A. CALLAN,
H. B. CHANDLER,
JOHN VAN DUYN,

Dr. E. E. Holt,
David DeBeck,
F. M. Wilson,
*A. E. Adams,
Chas. Stedman Bull,
*William H. Wilder,
John E. Weeks,
Horace G. Miller,
W. H. Carmalt,
Swan M. Burnett,
*Alvin A. Hubbell,
Myles Standish,
William Thomson,
W. V. Marmion,
S. O. Richey,
Russell Murdoch,
Edward Jackson,
Charles A. Oliver,
David Webster,

Dr. William F. Norris,
Samuel D. Risley,
W. H. Wilmer,
Howard F. Hansell,
J. A. White,
F. Buller,
Chas. H. Williams,
*Henry W. Ring,
*H. R. Price,
Walter B. Johnson,
O. F. Wadsworth,
J. D. Rushmore,
Chas. Hermon Thomas,
Harry Friedenwald,
Lucien Howe,
Samuel Theobald,
David Coggin,
R. L. Randolph.

A CASE OF EXOPHTHALMIC GOITRE, IN WHICH, OWING TO PANOPHTHALMITIS, THE ENUCLEATION OF BOTH EYES IN SUCCESSION BECAME IMPERATIVE.

BY DR. JAMES A. SPALDING,

PORTLAND, MAINE.

Up to April, 1895, Mr. A., a Dane by birth, had been perfectly healthy. He was then about thirty years of age, and a hard-working and industrious farmer just outside of Portland. On the 10th of April, as nearly as he could recall the dates of his illness, he had been working harder than usual, painting the outside of his house, when he suddenly felt dizzy, and on looking around he saw that every object that his glance embraced was double. The lateral separation of the images was quite considerable, but he was sure that the images were on the same level. On covering his eyes in succession, to discover if there were any difference in the sight which could account for the disagreeable diplopia, he found that the sight of the right eye was slightly blurred. On covering the right eye he failed to see double, and the dizziness ceased. On covering the left eye and trying to move about, he felt nearly as dizzy as with both eyes opened. He consulted his family physician, who in turn sent him to an ophthalmic surgeon, who diagnosticated paralysis of the internus (as I later heard), prescribed the iodide of soda, and directed the patient to wear a shade over the right eye to prevent the very annoying diplopia. A weak astringent lotion was also ordered on account of a well-marked inflammation of the lower conjunctival fold.

A few weeks later the right eye, which previously had not projected in the least, began to bulge forward quite noticeably; but the diplopia was not so disturbing as before, since at about the same time the sight of this eye was sensibly diminished. The patient, after further treatment with the galvanic current, was then advised by the consulting oculist that nothing more could be done for the eye, and that he had better see his family

physician owing to other symptoms needing medical treatment. Enlargement of the thyroid on the right side was now quite evident.

The medical treatment then instituted, whatever it may have been, did not seem to be of much benefit to the patient's health, for the thyroiditis, with increased heart's action and protrusion and deviation outward of the right eye, still persisted. The cornea also, according to the patient's assertions, now became so gray and hazy that the sight was reduced to a minimum. He could still see objects held close to the eye. The sight of the left eye remained perfect. Whether at this time the left eye protruded or not was hard to say; but, so far as could be determined, it remained in its normal position. The difficulty in forming an opinion in this respect lay in the fact that the protrusion of the right eye was so great as completely to throw into the shade any displacement of the left eye.

Having been several months under treatment without any benefit, Mr. A. consulted me in August, when I discovered the following conditions:

Right eye enormously protruded from the orbit, and the eyelids so much distended over the cornea as to remain immovable despite every effort to close them. Excessive chemosis of the conjunctiva, which surrounded the entire cornea with a dry, fleshy wall, as nearly as can be described. Cornea very much dessicated, and in the center a small abscess, — hypopyon. Oblique illumination seemed to show that the pupil was largely dilated, but this was difficult to determine with any accuracy owing to the haziness of the cornea. Cornea quite insensible to bits of paper or absorbent cotton. Perception of light in all directions. Tension of the eyeball increased.[1]

The patient had been suffering for several days with intense pain in the eye and orbit. He could not sleep without the exhibition of large doses of narcotics, and the latter were contra-

[1] I notice in consultation with younger men, nowadays, that they talk a great deal about "Tension." They say, for instance: "There is tension in that eye." Now I think, and I always say so at such times, that we ought to cling to the old-fashioned limitations of the word "tension," and say "increased tension" or "diminished tension"; for every eyeball, no matter how soft, has some tension, or it would collapse in toto. To say that an eye has "tension" does not convey an accurate idea of its condition.

indicated by his bodily condition. The temperature was over 100° night and day, and the pulse ranged from 130 to 160. The eye resembling one affected with panophthalmitis, and being rather timid about enucleating in that condition, I resorted to leeches to the temple, to scarification of the conjunctival folds, and to division of the external canthus. Finally, however, all these means failing to relieve the condition of pain and suffering, the eye was safely removed. On opening it, immediately after the operation, pus was found in the anterior chamber, as well as behind the ciliary processes on the temporal side and in one separate focus in the vitreous, just as we see it in panophthalmitis following perforating injuries of the globe.

The result was very favorable, and the patient soon returned to his home. Careful examination before his departure showed well-marked swelling of the thyroid, on the right side chiefly, though moderate, indeed, in proportion to the enormous protrusion of the orbital tissues, which even after the removal of the eye, pressed, angry looking, far between the commissure of the eyelids, preventing any attempt to close them except by actual force. The whole orbit remained then, and still remains, filled with hard, brawny tissue.

Thyroid extract was administered in small and regular doses for a long time, and, being well borne, was continued, with the result of reducing somewhat the swelling of the thyroid.

Three or four weeks later slight conjunctivitis was noticed in the lower fold of the left eye, but it disappeared after using a mild boric acid lotion. There was no protrusion of this eye. The pulse remained about as before, but there was no rise in temperature above the normal. Through the early winter the eye remained in excellent condition, and the sight was perfect.

On the 9th of January, 1896, and without previous warning except of slight pain in the temple the night before, the left eye became irritated and the sight affected. I saw the patient the same day, and observed well-marked chemosis of the lower conjunctival fold, protrusion of the eyeball forward and a trifle upward, but the media were still transparent. The ophthalmo scope revealed nothing but extremely tortuous retinal veins. In a day or two optic papillitis set in in the most exquisite

fashion, the papilla rising high above the level of the rest of the retina, and the retinal vessels becoming even more tortuous than before. The sight rapidly decreased, not only from this condition of the optic nerve, but from haziness and then from absolute necrosis of the cornea. In ten days the appearance of this eye resembled that of its former partner, and sight was reduced to perception of light. Furthermore, persistent pain ensued in the temples and orbit, and soon became unendurable except after using sedatives. Cocaine seemed for a day or two to keep the cornea moist; but when that effect ceased, cloths in albolene were employed. The lids, it is hardly necessary to say, could no longer be closed over the cornea owing to the extreme protrusion of the globe.

At this time, with rise in temperature to 103° and pulse more rapid than ever, there seemed no recourse except enucleation, though naturally we wished to give the poor sufferer every chance to retain some sight. One suggestion was to evacuate any possible pus in the orbit; but the condition of the tissues in the opposite orbit, still hard and stiff months after enucleation, showed us how hopeless such a procedure would be, and might but subject the patient to two operations if there were no pus discovered.

At this time there was no corneal abscess as in the other eye, and, as the cornea might be cleared by some treatment or operation to me then unknown, I consulted all available authorities for similar cases. The only one resembling mine was found in Mooren's "Fuenf Lustren," a book illustrated with innumerable clinical observations, which are often of great value to the ophthalmic surgeon when in doubt.

This case of Mooren's was that of a woman who for many months had been overwhelmed with mental anxiety arising from the care of a paralytic sister and an aged and feeble father, who was subject to frequent attacks of angina pectoris.

The increased action of the heart in this lady was at first attributed to her mental overwork, and the injection of the lower conjunctival fold to a slight conjunctivitis. But after a while it became too plain that the eyeballs were gradually be-

ing protruded. Gray infiltration of the cornea soon set in, first in one eye, and then in the other. A week later Mooren was was called in hastily, only to find that during the night the left eye had burst open after violent pain, and on removing the improvised bandages he found the transparent lens lying between the lids, while the vitreous hung out from a large gap in the cornea. The corneal infiltration in the right eye persisted for months, and the slight perception of light gradually increased. After nearly a year of waiting and treatment an iridectomy was made, and the patient could see to count her own fingers close to her face; but soon again the sight was reduced to mere perception of light.

This, then, the only accessible case, did not offer much encouragement for my patient.

While still considering what was best to be done, the corneal infiltration assumed a purulent form, with rapid hypopyon and with a perforating ulcer of the cornea. Finally, a day or two later, the patient insisted that the eye should be removed, as he was obliged to confess his utter sightlessness, and his unwillingness to endure so constant pain and suffering. The operation was very difficult owing to the infiltration of the orbital tissues, and I had to proceed very slowly; the scissors seemed to have no cutting power, though apparently sharp enough in usual enucleations. Well-marked purulent choroiditis was discovered on opening the globe. The optic nerve was macroscopically swollen for some distance behind the globe and extending into the orbital tissues.

The patient was soon discharged without any unfavorable symptoms, and to this day remains even better in condition, physically, than when I last saw him, a year ago. He still uses the thyroid extract in five-grain doses from time to time for a period of a month or two, and attributes a good share of his health to that form of medication. The thyroid is now but little swollen.

A brief résumé of this interesting case shows us, judging from the ophthalmoscopic examination of the left eye before the cornea became infiltrated, that with the enlargement of the thyroid gland almost exclusively on the right side of the neck, first

the orbital tissues of the right side, and then of the left, became inflamed and engorged, causing optic neuritis and gradual obstruction of the nutrition of the eyeball, first in the optic nerve, then in the anterior portion of the globe, then extending to the cornea, which dessicated and sloughed, giving rise to an ulcer by absorption and the consequent purulent infiltration of this tissue, finally exciting a typical choroiditis purulenta or panophthalmitis, as it appears classically after operations of various sorts on the eye, or from injuries, or finally from the presence of foreign bodies within the globe.

Finally, the case shows that, with proper aseptic precautions, eyeballs affected with panophthalmitis can be safely removed.

A CASE OF EXOPHTHALMIC GOITRE FOLLOWING ETHER ANÆSTHESIA.

By WM. F. AIKEN, M.D.,

SAVANNAH, GA.

Mrs. J. M. M.——consulted me October 1, 1890, complaining of prominence of both eyes, pain in the eyes and head, and imperfect vision. Her age was 41; previous health good with the exception of some moderate symptoms of a local character caused by a lacerated cervix; had borne five children, three of them then living; family history negative. Rather above medium size and of sturdy, robust appearance, she was quiet and phlegmatic in manner and possessed of more than average self-control.

On December 17, 1889, nine and a half months before I saw her, Dr. E. R. Corson of Savannah had performed a cervix operation upon her under ether. The patient showed considerable congestion of the face and mental excitement while the ether was being administered, and before the operation was begun and about the time when consciousness was abolished, a lady friend present observed a marked prominence of the patient's eyeballs, and this prominence persisted after the comple-

tion of the operation and the patient's recovery from the anæsthetic.

From that time she dated all the symptoms for which she consulted me. Besides the eye symptoms she had noticed some fullness about the throat and a rapid pulse with palpitation of the heart. She also complained of enlargement of the pupils with photophobia, and attacks of flushing of the face. She had first felt some improvement of all the symptoms in the latter part of July, or seven months after the onset of the trouble, but she still presented a typical appearance of exophthalmic goitre. The enlargement of the thyroid was plainly noticeable when the light fell across the neck from one side, the eyes were sufficiently prominent to disclose the sclera above the cornea, pupils larger than normal, pulse eighty-eight, and conjunctival blood vessels somewhat dilated.

V. D. 20/70: with + 1.75D = 20/30:
V. S. 20/40: without possible improvement.

Considerable pain was caused by the use of the eyes during this examination.

The ophthalmoscope disclosed central excavations in both discs, with sharply "kneed" vessels at their upper margins. The tension of both eyes was normal. Careful inquiry failed to elicit anything like the history of glaucomatous attacks, and this fact, together with the normal tension and the limitation of the cupping to the centers of the discs, warranted my employing atropin to quiet the ciliary effort that was evidently the cause of the pain when I attempted to measure the error of refraction. After two days under atropin I found the vision as follows:

V. D. with + 2.50 D ◯ +. 50 D Cyl. Ax. 90° = 20/20:
V. S. with + 2.75 D ◯ +. 50 D Cyl. Ax. 90° = 20/20.

I ordered this correction to be worn constantly, the eyes not to be used for near work and consequently requiring no correction for any presbyopia there may have existed. I also prescribed five grains of iodide of potassium with 1/30 grain bichloride of mercury t. i. d.

After eighteen days, during which time no improvement was noticeable, she left me to consult other physicians. About two

years ago I again saw her, when she informed me that her trouble had lessened gradually with the lapse of time, no treatment seeming to have benefited her perceptibly. At this time she came to me not as a patient, but accompanying her husband who was developing cataracts. A year ago, however, I re-examined her eyes, after extracting the husband's cataracts, and found her refraction unchanged. I ordered her the same distance glass with a stronger for reading in place of a faulty correction that I. found her wearing upon the advice of an optician. All signs of exophthalmos had disappeared. In other words, nature had cured the disease in from six to seven years.

I report this case as perhaps throwing some light on the pathology of exophthalmic goitre. The suddenness of onset and the fact that it occurred during the stage of excitement of ether anæsthesia seem quite significant. I believe the only drug hitherto credited with having given rise to this disease is iodide of potassium, and for this reason, if for no other, I am desirous of having this case go on record.

Of the several theories extant regarding the etiology of Graves' disease, I personally favor that of Brown-Sequard assigning it to a central origin. The fourth ventricle seems most probably the site of the initial disturbance, giving rise to the vasomotor and trophic changes which, in turn, so affect the thyroidal functions as to produce the disturbances of a chemical or toxic character. While gross lesions have been demonstrated in the fourth ventricle by the autopsies of W. H. White (*Brit. Med. Journ.*, March 30, '90), who found there a hemorrhage in a case where the disease followed pneumonia, and of Kimura (*Sei-I-Kwai*, Tokyo, October 27, '94) who also found a hemorrhage in the fourth ventricle; it is nevertheless quite possible that other cases may be due to circulatory or other functional disturbance at that point without there existing any visible lesion after death. That section of the restiform bodies can also produce the characteristic symptoms in rabbits has been demonstrated by Brissaud (*Practitioner*, London, October, '95).

The fourth ventricle is furthermore suggested by the association observed to exist between this disease and diabetes, as

noted by Manby (*Brit. Med. Journ.*, May 10, '90), and by Barnes (*ibid.*, June 1, '90), while the undoubted influence of heredity is as consistent with this theory as with any other. Monocular cases like Friedenberg's (*Med. Record*, N. Y., July 13, '95), seem to me to point to a central nervous disease involving a limited area, rather than to less circumscribed causes such as primary glandular disease or affection of the sympathetics.

In the case of my patient I have always thought I had to do with a hemorrhage, most likely in the fourth ventricle. The suddenness and completeness of the onset and its occurrence under the condition of congestion and excitement caused by the ether, as also the gradual but steady recovery such as is so frequently seen after hemorrhagic paralyses, seem sufficient proof upon which to base the assumption of a hemorrhagic lesion.

REPORT OF CASES OF PULSATING EXOPHTHALMOS.

BY WILLIAM H. WILDER, M.D.

CHICAGO, ILL.

Although this affection is quite rare, I had the unusual fortune to meet the three following cases within a period of one year.

Unfortunately, the record in two of them is incomplete, for, as will be seen, they refused the treatment that furnishes the best chance of recovery, notwithstanding which they are still alive.

CASE I.— Samuel S., colored, æt. 39. Father, whose health has always been good, was drowned. Mother died of inflammation of the bowels. Remaining family history good. Patient's health has usually been good. He contracted syphilis fifteen years ago, for which he was treated, and from which he says he recovered.

On October 13, 1893, he came to the Illinois Eye and Ear Infirmary, and gave the following history: His present trouble began three months before quite suddenly. The first symptom

that he noticed was a neuralgic pain in the right eye, followed in a few hours by redness of the eyeball. Two days later there was considerable swelling of the lids and surrounding parts, which continued to increase rapidly until the time of the examination at the infirmary. He complained of considerable pain in the eye and side of the head, and that the swelling was always more noticeable in the morning.

At this examination the condition was as follows: There was marked proptosis, so that, on separating the lids, the eyeball looked as if it would pop out of the socket. The right eye protruded as much as 12 mm. in front of the left. Pulsation of the bulb was distinct, both to sight and touch, and there was also a large vessel at the inner and upper part of the margin of the orbit that pulsated visibly. The bulging and pulsation were increased by bending the head forward.

The episcleral, as well as the conjunctival vessels, were distended, and the pupil did not respond to light. Tension was normal. R. V., 20/120; L. V., 20/40.

The retinal veins were distended to nearly three times the width of the arteries, but no pulsation was observed. Heart sounds were normal, except that the second sound seemed to be slightly accentuated. A loud bruit was heard over the carotid at the point of division into its external and internal branches, and this murmur could also be heard with great distinctness over the right temporal artery, and also over the region of the frontal vein and over the eyeball.

Compression of the carotid caused cessation of the roaring noises in the head and the bruit, and also lessened the proptosis. These roaring noises are always present, being noticed in the right ear.

The power of moving the right eye upward and outward was lost, but there was still control of the motion downwards and outwards.

Potassium iodide was prescribed in 10-grain doses three times daily, the quantity to be increased by one grain each dose after a few days of the treatment.

Ligation of the right carotid was advised, but he refused to have this done, and seemed to be terrified by the idea of an

operation. Neither would he consent to having digital compression practiced. He was seen at frequent intervals for three months, during which time he was taking the potassium, but irregularly. At the end of that time the swelling was no larger, and possibly somewhat smaller than it was in October. I kept track of the case for one year, not noticing any change, and then he disappeared.

CASE II.— I am indebted to Dr. Ralph Isham of Chicago for the privilege of presenting the history of the following case, which has never been put on record, and which I did not see at the time when the eye showed the condition of pulsating exopthalmos.

George T., a brakeman, 30 years of age, of good previous health, on October 28, 1880, was caught between two box cars while attempting to couple them, and sustained a crushing injury to the head. He says that he retained partial consciousness for one hour after the accident, and then became totally unconscious, remaining in this condition about one hour. On recovering sensation, he noticed a roaring and throbbing in the head, and in the succeeding three days there were occasional periods of unconsciousness and delirium.

Within a day or two after the accident it was noticed that the right eye was protruding, that it was reddened and pulsating, and that the sight was impaired. The left eye remained unaffected. Patient states that there was no bleeding from the ears or nose.

Three days after the date of the injury he was seen by Dr. Isham, who made the diagnosis of aneurism, and advised ligation of the right carotid, which was accordingly done the following January, 1881, about one month later, by Drs. Isham, Fenger, and Jacobson.

Prompt cessation of the pulsation followed the operation, as well as relief from the pain which had been present since the receipt of the injury; but, unfortunately, this result was of short duration, for both the pulsation and the pain returned about three days later, and persisted until a second operation, ligation of the left carotid, was done in April, three months subsequently.

A few days after the second operation paralysis of the right side supervened, together with ataxic aphasia and partial loss of taste. The aphasia began to gradually disappear after five weeks, and the paralyzed side improved in two months. Partial impairment of taste remains.

The sight of the right eye was reduced to nothing, and six months after the second operation he developed an inflammation of the left eye, probably an irido-cyclitis, which soon destroyed vision, leaving him completely blind. The pain and pulsation of the eye ceased after the second ligation, and did not return; but the tinnitus, which had been constantly present, persisted until 1888, when, after an attack of fever, it also disappeared.

About one year ago this unfortunate, while bending forward, struck his right eye against a chair, and injured it so severely as to make it necessary to remove it. It was eviscerated at the Illinois Eye and Ear Infirmary.

Present condition: Slight diminution of strength of right arm and leg. General health good; there is no headache. A slight hesitation in speech is apparent, but he says that his mind is perfectly clear — a statement that his friends confirm. Heart sounds are normal, and they may be heard distinctly over the carotid of the right side as high as the upper margin of the thyroid cartilage, but not above that line, while on the left side pulsation may be felt on deep pressure, and the cardiac sounds may be heard on placing the stethoscope over the artery.

The right eye is gone. There is a dense leucoma of the cornea of the left eye, and a ciliary staphyloma on the nasal side.

The next case was first seen at the Illinois Eye and Ear Infirmary about three years ago in the dispensary service of Dr. Beard, through whose courtesy I have followed the case, and made use of the history he had taken.

CASE III.— Michael D., a switchman, æt. 33, while coupling two cars, April 4, 1884, had his head crushed between them. He was picked up by some comrades, who noticed him bleeding from the ears and nose, and taken to the county hos-

pital. The hemorrhage of the ears gave place to a watery and then a purulent discharge, which continued several weeks. He says that, although stunned, he did not lose consciousness. He noticed very soon after the accident that he could hear rushing noises in his head with every heart pulsation, and that he was quite deaf. These noises have persisted. Six weeks after the date of the injury he saw double images, but this symptom gradually disappeared.

Soon after the injury he noticed that the right side of his face was completely paralyzed, and that the left side of the body was weak. He does not remember the exact time when the eye began to enlarge and to pulsate, but thinks it was shortly after the accident. Previous health had been good, and patient had never contracted syphilis.

The prominence of the left eye and the paralysis of the right side of the face give the patient a peculiar appearance. He says that the condition of the muscles on the right side of the face has improved somewhat in the last ten years. Occasional twitchings of the muscles of that side are observed, particularly those of the chin. There is marked exophthalmos of the left side, which is increased when the patient bends his head forward. The upper lid is swollen, and at the upper and inner side of the orbit, over the site of the frontal vein, are two large vessels that pulsate visibly. The conjunctival and episcleral veins are enlarged. On placing the hand upon the eye, a strong pulsation is felt with each beat of the heart, more intense when the patient bends forward. This pulsation may also be seen. On placing a stethoscope over the eye, a loud bruit is heard synchronous with the first sound of the heart. The bruit may also be heard when the instrument is placed over any part of the head, but it is most distinct over the left side, and particularly over the left eye and the left ramus of the inferior maxilla. It may also be heard over the vessels in the left side of the neck. The patient says his wife hears it at night. When the left common carotid is firmly compressed, the bruit and the pulsation of the eyeball, as well as that of the enlarged frontal vessels, cease, to return again the instant the pressure is relaxed. The subjective symptoms of noises in the

head also disappear on compressing the carotid. The iris responds to light and accommodation. The right eye is in every way normal, and R. V. 20/20, L. V., 20/150, improved by Sph. +3.5 to 20/60. The retinal veins appear to be slightly enlarged, not markedly so, but otherwise the fundus seems to be normal. Movements of the left eye upward and outward seem to be somewhat restricted, otherwise there is good mobility.

Patient never has headaches, but is troubled with incessant noise, which he likens to that made by steam escaping from a boiler, naturally worse when his surroundings are quiet, and intensified with each heart beat. Hearing right ear c./30. Large cicatrix in posterior inferior and posterior superior quadrants apparently connected with annulus, and at this point there is seen a hard projection from the posterior wall of the auditory-canal. Hearing of the left ear 12/30. Membrane opaque, with cicatrix in the anterior superior quadrant. Ligation of the left carotid was advised, and the danger of delay explained, but up to the present it has not been done. The patient is now in good health, thirteen years after the injury, and works regularly as switchman on one of the railroads entering Chicago.

We have here cases presenting almost all of the typical signs and symptoms of pulsating exophthalmos, occurring either spontaneously or as the result of a trauma.

It is not to be inferred, however, that because they present so many symptoms in common that the pathogenesis is necessarily the same. In fact, although the literature is quite extensive, there has been comparatively little opportunity for study of the condition on the dead subject. Rivington ("Med. Chirurg. Trans.," Vol. 58, p. 183), Harlan ("TRANS. AMER. OPHTH. Soc.," 1875), and Schlaefke ("Graefe's Archiv. f. Ophth.," XXV, 4-S. 112) have, from time to time, tabulated the literature of this subject, but not so fully as did Sattler, who, in a monograph in "Graefe-Saemisch Handbuch der Augenheilkunde," reviewed the histories of 106 cases — all that had been published up to 1880. Müller, in an inaugural dissertation entitled "Zur Casuistik des pulsirenden Exophthalmus," reviews 62 cases recorded between 1880 and 1890.

Up to 1890 there had been recorded 24 autopsies. In two of these the only lesion found was aneurism of the ophthalmic artery within the orbit — the cases of Guthrie and Carron du Villards, mentioned by Sattler. In four traumatic cases there was rupture of the internal carotid in the cavernous sinus; in three idiopathic cases there was spontaneous rupture of the artery in the cavernous sinus; in four cases there was aneurismal dilatation of the carotid in the sinus, with no rupture discoverable; in six cases, in which the symptoms were characteristic of pulsating exophthalmos, no aneurism and no arterial lesions were found; in one case there was aneurism of the ophthalmic artery before its entrance into the orbit; and in four cases, instead of aneurism, vascular tumors of the orbit were found, in two of these the neoplasm was seen springing from the cerebral hemispheres, and destroying the orbital plate of the frontal bone. It will thus be seen that we have to do with a condition whose pathological features are diverse, whatever may be said of its clinical aspect.

Concerning the etiology, the cases may be placed in two groups — those occurring spontaneously or idiopathically, and those brought about by traumatic action.

Naturally, any weakening of the vessel walls, from whatever cause, would predispose to this peculiar injury; and, if with such a condition of the internal carotid, the individual should make some violent exertion, or be seized with a sudden *fit of coughing* or vomiting, we can understand that the vessel might burst.

Dempsey ("Brit. Med. Journ.," 1886, Vol. II, page 541) records an interesting case in which a few hours after confinement, the woman had a fit of vomiting, experienced severe pain in the head, and soon developed all the symptoms of pulsating exophthalmus.

The autopsy showed an aneurism of the internal carotid near the sella turcica.

Syphilis may operate as a cause by bringing about an endarteritis of the carotid, and so a gradual dilatation or rupture of that vessel. I am inclined to look upon the first case I described as one of this class. There was no history of an in-

jury, or any violent exertion; the swelling, pain, and noises came on suddenly with no apparent cause.

Of the cases catalogued by Sattler, 32 are regarded as idiopathic, and 59 as traumatic. Müller's statistics show 15 idiopathic cases, 41 traumatic (in six no mention is made in the history of the etiology); so that in 147 cases there were 47 idiopathic — a percentage of about 32.

The important point in diagnosis is to determine whether the pulsating exophthalmos is due to a vascular or other tumor in the orbit, or is occasioned by aneurism, either arterial or arterio-venous. The history will throw much light on this point. If the trouble dates from a severe injury of the head, and the pulsation and swelling become suddenly prominent, there would be little reason to doubt that there exist an aneurism.

In general, the development of the proptosis and pulsation would be much more rapid in aneurismal swellings than in tumors, and, in addition, the latter would be much less resistant to pressure than the former. Again, the nodular and irregular outline of a growth, or its extension into adjacent or distant parts by metastasis, might betray the nature of the affection.

The prognosis is grave. Ten cases recovered spontaneously, and then by a fortunate clotting of the blood in the sinus blocking the point of rupture in the artery. Spontaneous recovery is recorded in about fourteen cases.

The treatment will vary with the nature of the lesion. Extirpation of a cancerous growth would be indicated, and the same would be said of certain vascular growths, which might be successfully removed by electrolysis. Compression of the carotid has not been very successful, and should not be relied upon. Sattler reports, out of 29 cases on which it was tried, only four of permanent cure. Five were improved. Müller's statistics, however, are more favorable to this method, for of seventeen cases on which it was tried seven were cured.

Ligation of the common carotid of the affected side seems to have given the most satisfactory results, and is the remedy to be most relied upon. Of 87 recorded cases on which this operation has been done, it was successful in 52, or about 60%;

FIG. 1

FIG. 2

ten cases died after the operation, a mortality of 11½%; and 25 cases, or 28.7%, were either not benefited by the operation at all, or the good result was of short duration.

DOUBLE EXOPHTHALMOS WITH ULCERATIVE DESTRUCTION OF THE EYES IN AN INFANT FROM SARCOMA OF THE DURA MATER, STARTING MOST PROBABLY AT THE SELLA TURCICA — EXTENSIVE PATHOLOGIC CHANGES IN THE BONES — DEATH — AUTOPSY.

BY SWAN M. BURNETT, M.D., PH.D.

WASHINGTON, D. C.

Jessie Irving, a well-nourished mulatto infant of five months, was brought to my clinic, at the Emergency Hospital, by her mother, with the statement that she had first noticed something queer about her right eye some two months before. At the time of examination, August, 1893, there was a marked exophthalmos of the right eye, which was turned strongly outward. There was paralysis of all the muscles of that eye except the external rectus. The child was too young to determine positively whether there was any sight remaining. The fundus appeared unchanged from the normal in any important particular. In addition to the eye trouble there was a diffuse swelling in the temporal region of the right side. The girl was born in a normal labor, without the assistance of any instruments, and there was no history in either father or mother of a syphilitic taint. Up to that time the child had been perfectly healthy, and even now made no complaint, and took the breast and slept well. The swelling in the temporal region gradually enlarged, and at the end of a month became soft at a point midway between the upper border of the auditory canal and the external angle of the eye. An exploratory incision was made under chloroform, and a quantity — estimated at two ounces — of brownish yellow liquid escaped. A probe was introduced and disclosed a cavity

inside the cranium which was probably the size of a large walnut. Following this probing there was an excessive hemorrhage which could only be controlled by packing the cavity with iodoform gauze and applying a tight bandage. The child was taken into the hospital and at the end of four days the dressings were removed. There was no further hemorrhage. The cavity was packed again with iodoform gauze, and this was repeated at proper intervals until the cavity closed at the end of some three months. The child, in the meantime, continued in perfect health, and was bright and cheerful. The exophthalmos quite distinctly diminished, but the motion of the eyeball continued as restricted as before. There was at that time no appearance of change in the nerve head, but it was doubtful whether any vision remained in the eye.

The patient then disappeared from observation and was not seen again until the spring of 1895. It was then as well grown as any child of that age, and was in perfect health. The right eye was still somewhat more prominent than the left, and the paralysis had persisted. Examination showed that the wound in the temporal region had healed perfectly, though that side was somewhat more prominent than the other. The great amelioration in the condition was attributed to prayers.

Some weeks afterwards the child was again brought to the clinic with an increase in the exophthalmos which had been noted as beginning soon after the last visit. It was, however, unattended with any general disturbance. This exophthalmos increased from week to week. Suddenly one morning in June, 1895, it was discovered by the parents that the child could not see out of the other (left) eye, though it had been playing around the room as usual the night before. The child was now totally blind. An examination revealed no change in that eye either externally or internally. There were not then, nor had there been at any time, symptoms of paralysis of any of the cerebral or spinal nerves, other than those mentioned. Soon an exophthalmos began to be noticed in the left eye also, and it was thought best to send her to the Children's Hospital.

The following notes of the case during her stay in the hospital are kindly furnished by the Resident Physician, Dr. Ashford:

FIG. 3

FIG. 4

"J. I., aged two years and four months, admitted July 12, 1895. Family history good; just recovering from measles; well nourished. Both eyes exophthalmic, right much more so than left. Right eye immobile and there is sloughing of the cornea. Left eye nearly fixed, but some movement of the lids. Child listless, but no paralysis anywhere except in the eyes. Appetite good; bowels good; sleeps well. There is a discharge of thick purulent matter, mingled with blood, from the right eye and the right nostril, and some purulent discharge from the left nostril. August 5th — exophthalmos of both sides much increased, and there is a prominence at the root of the nose on the right side in which there is a sinus connecting with the post-nasal cavity, and through this there is a discharge of very offensive matter. The upper lid of the left eye is still movable, but both eyeballs are fixed. Ulceration of right cornea increasing. The appetite is still good, and she sleeps well; there is, however, a distinct loss of flesh; no pain complained of (Photograph, Fig. 1, was taken at this time). August 12th — increase in the swelling at root of nose, and the left cornea is beginning to ulcerate. Though she eats and sleeps well, she is getting more emaciated and weaker. The condition steadily grew worse from this time on. On Sept. 5th, the pulse was weak, slight twitching of the muscles of the right hand during the night; left side colder than right. On September 11th, she died quietly at 5.30 A. M." (Photograph, Fig. 2, was taken by Dr. Gray after death).

An autopsy was made by Dr. D. S. Lamb of the Army Medical Museum, that same afternoon. The following is an account of the

POST MORTEM EXAMINATION.

"Emaciated. Purpuric spots over body. Consistency of skull good. Sutures well united. Dura mater very adherent. Abundant cerebral fluid. Partial absorption of frontal lobe of brain on right side. Mass attached to left orbital plate and can be scraped off from before backwards. Growth began outside the dura mater, and extended backwards. Dura thickened back of tumor. Brain not involved in any place. Pus on right side in olfactory region. Ethmoid seems to be entirely destroyed. Large mass of new bone affecting right orbital plate. It is

twelve times thicker than normal. Left orbital plate pushed upward and four times thicker than normal from new bone. Part of contents of left orbit taken out for examination. Whole posterior portion of orbital side of sphenoidal fissure destroyed on right side. Wings of sphenoid in good condition except at base. Nasal bones are disarticulated and pushed to left side. Nasal fossæ filled with hypertrophied tissue and greenish pus. At junction of parietal, malar, sphenoid, and frontal bones there is excessive hypertrophy. Greater wing of sphenoid hypertrophied so as to nearly obliterate the middle fossa of the skull. Brain apparently normal. Tumor is flat, two and three-quarter inches long, two and one-half inches broad, one and one-half inches thick at thickest part (Fig. 3 shows the relative size and position of the tumor at the base of the brain). It is vascular, reddish, limited on brain side by dura, and has points of degeneration."

It could be easily seen on inspection of the specimen after its removal from the cranial cavity that the optic nerves pierced the dura mater and passed out into the substance of the tumor at a distance of one and one-half centimeters from the commissure on the right side and two centimeters on the left side. The third nerve passed through the dura and into the tumor some distance behind this. From these appearances, in connection with the clinical history, we can infer very justly, I think, that the morbid process began under the dura on the right side near the anterior clinoid process, since it involved the third nerve first of all, but anterior to the posterior clinoid process, since the sixth nerve was not affected. The optic nerve was probably not implicated at that time to any serious extent. What was the nature of the pathologic change at the beginning, which, while evidently so limited as to the central parts, was sufficient to cause such extensive manifestations in the right temporal region and orbit? It would seem most likely that it was of a cystic character, or, at least, that there was an unusual amount of fluid formed, the pressure of which was exerted in this particular direction. When this was evacuated and drainage was established, the morbid process was checked, or held in abeyance for at least eighteen months, at

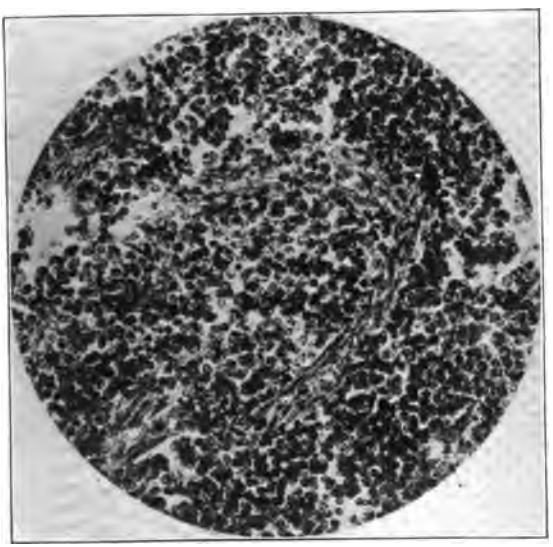


FIG. 5

any rate so far as the fluid formation was concerned. The original lesion, however, still persisted and was extending forward in a manner to involve more slowly the bones on the right side of the sella turcica. That it did not extend over to the left side until much later is evidenced by the sudden appearance of blindness of the left eye, indicating an involvement of that nerve, and before the third nerve on that side was affected, only a short while before the end. The very early appearance of the trouble, about the second or third month after birth, would lead us to suspect that the morbid process had its origin *in utero*, and was congenital. Another interesting feature, from a general pathologic point of view, is that the primary changes were limited, almost altogether, to the bony tissue, these changes being both of a destructive and hypertrophic character (Fig. 4 shows a horizontal section through both orbits and sphenoids). Though lying under and most probably springing from the dura mater, it nowhere perforated that membrane. The histology of the mass showed it to be a sarcoma (Fig. 5). The disease had not, however, been carried by metastasis to any organs or tissue at a distance, but remained strictly localized, although the seeds of the disease had been present in the system ever since birth, and probably before.

DISCUSSION.

DR. J. O. TANSLEY, New York. I have had several of these cases of pulsating exophthalmos, two of which stand out in my memory and act as beacons in telling me what to do in similar cases. One of them I reported to this Society a few years ago, and I will give a short synopsis of the second.

A doctor of medicine came to New York to study ophthalmology and otology and fell into my hands. He had a very slight discharge from his nose, and a small piece of ill-smelling sputa would be expectorated from the naso-pharynx each morning, but at no other time. He was advised to pay no attention to it. He was going to London and took letters of introduction to Sir Morrill McKenzie, whom he consulted about his condition. Dr. McKenzie told him that he had ethmoid disease and he would not operate upon him, but recommended him to one of his friends. He accepted this advice and I have a written description of the operation. The doctor made an examination with a probe, said that he distinctly felt dead bone which he

seized with a pair of forceps and exerted some traction, which was almost immediately followed by a gush of blood that filled the whole nasal cavity, and, in a few moments, the patient, the bed, and the doctors were deluged in blood. They stopped the operation, of course, filled the nose with strips of gauze that were packed very strongly in the nasal cavity, and happily stopped the hemorrhage. But almost immediately the left eye began to bulge, and continued to do so, until it protruded markedly from the orbit; pulsating also. When the patient came out of ether, he complained of a disagreeable bruit in his head. This was listened for, and, by placing the ear on the head, could be distinctly heard. They put him on a very low diet, with a limited supply of liquids, so that he was almost starved to death. They ligated the left carotid and the pulsation and bruit disappeared, but the exophthalmos continued, and the pulsation was resumed in four days after the ligation. Of course, they expected him to die, and they made every arrangement to ship his body to this country. After a number of weeks the patient became restless, and said he would rather "Eat, drink, and be merry," and die, than to suffer from hunger and thirst, and live miserably. The exophthalmos gradually disappeared, but the bruit continued for a number of months. This same physician was an assistant in my clinic for a year, and is now practicing ophthalmology and otology in one of the cities of Canada. He has, of course, no sight in the left eye. He is very happy in having an excellent practice, and it may be a pleasure to you, as it is to me, to know that he can tell as good and as many stories as our friend John Green.

PATHOLOGY OF CHRONIC MEMBRANOUS CONJUNCTIVITIS.

BY DR. LUCIEN HOWE,

BUFFALO, N. Y.

The following observations in regard to a form of pseudo-membranous conjunctivitis will be made clear by giving first a very brief history of the two cases illustrating the condition referred to. The cases are as follows:

G. W., a boy eight years old, was brought to the Buffalo Eye and Ear Infirmary in October of 1894, on account of a small conjunctival polypus. His mother objected to its removal, and

the child was lost sight of until November, 1895. She then said that for about four weeks previously she had noticed a swelling of the right upper lid, with some discharge from the conjunctival sac. At the time of this second visit the condition presented was peculiar. The right upper lid was much swollen, and the upper palpebral conjunctiva was found to be covered with a yellowish white membrane, at least two or three millimeters in thickness, its edges sharply defined, and attached so firmly to the lid that, although it could be dissected off with a blunt spud, there remained exposed a rough, bleeding surface. The secretion in the conjunctival sac was quite abundant, but the globe of the eye was remarkably free from any signs of irritation. The cornea was clear, except for a small nebula in the center, which the mother insisted was caused by a slight burn some year or two previously.

The condition thus described has been subject since to slight variations, the membrane sometimes extending over a larger portion of the conjunctiva, sometimes contracting along the edge, as one form or another of the treatment has been employed. One such exacerbation bears so directly on the question of causation that it should be mentioned. On January 4, 1896, about five weeks after his entry at the infirmary, the boy complained of soreness of the throat. The patches on the conjunctiva increased in thickness at this time, extending over the larger portion of the lower lid and over the caruncle and puncta. Examination also showed patches of a similar membrane behind the tonsils. These patches in the throat increased rapidly in size, covering nearly one side of the pharynx. The temperature rose to 103; and, although the child had been isolated since his first entry at the infirmary, he was transferred on the 6th of January, 1896, to the Buffalo General Hospital. There he came in contact with other children, two of whom, in the same ward, developed diphtheria and died. The patient returned to the infirmary two months later, where he has since remained. This condition of the eye has again varied somewhat, according to the treatment employed.

This question of treatment is so interesting as to tempt to a considerable digression, but it should not be passed without

reference to the numerous and persistent efforts made — most of which proved of little or no value. Many of those in the accompanying list have been found mentioned in the literature of these cases, or have been used because they seemed indicated.

Passing from the simple methods to those more energetic, I find we have used:

Cold applications, increasing in frequency to every half hour.

Saturated solution of boric acid.

Sublimate from 1 to 2,000 to 1 to 250, as often finally as every two hours.

Calomel.

Antinosine in 1 per cent. solution.

Methyl blue in solution, and finally in stick. (Method suggested by Janicke.)

Formaline, 1 per cent. to 4 per cent.

Papoid, increasing to once every two hours. Trypsine. Peptinzyme.

Extract of suprarenal capsule. Injections of diphtheria anti-toxine. Jequerity. Hydrozone.

Peroxide of hydrogen. Lemon juice. (Often advised by French writers.) Citric acid.

Copper sulphate.

Silver nitrate in solution.

Silver nitrate in crystal, and mitigated stick.

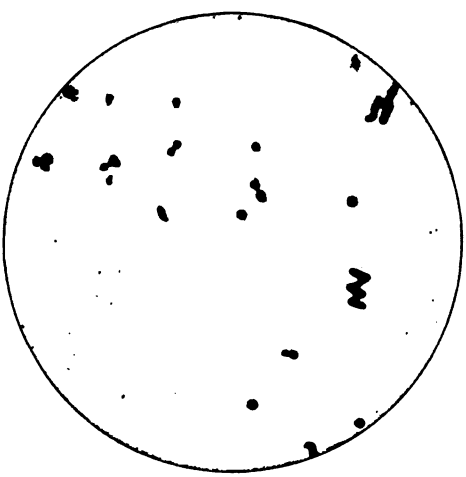
Dissected off membrane.

Dissected off membrane, and followed with brossage, with sublimate 1 to 250.

Dissected off membrane, and burnt conjunctiva with silver nitrate crystal.

Dissected off membrane, and burnt conjunctiva with platinum wire.

It was interesting to observe that when the membrane had been entirely dissected off, with the sub-adjacent tissue and the surface then burnt with silver nitrate crystals, or with platinum wire, the membrane would begin to reform within twenty-



four hours, and by the third day would be as thick and flourishing as before. I have occasionally suspected that too much was done, and have suspended all treatment; but found it necessary to return to some one of the better forms.

During the last few months formaline solutions have been used again, with apparently some improvement. The membrane has contracted to less than one-third of its former size; and now, eighteen months after the deposit formed, it is at last so thin as to show the tissue of the lid beneath, and is of an opalescent white, instead of a decided yellow, as before.

[This patient was exhibited to the Society.]

Of course, the disease aroused much interest from the first from the bacteriological standpoint. Examinations were made of cultures from the boy's eye at the laboratory of the City Board of Health a number of times. The Loeffler bacillus was discovered there once; at other times a diplococcus was isolated, but not inoculated. The cases have also been studied carefully and independently by Drs. Ullman and Thornbury, the latter having charge of the bacteriological laboratory at the University of Buffalo. The results obtained by these two observers agree in all of the principal features. The results are embodied in the special report by Dr. Thornbury. He says, with reference to the boy, that the membrane is non-detachable, is composed of fibrin and cells with a few bacteria, the cells comprising polynucleated corpuscles, leucocytes, etc.; within some of the polynucleated cells, and outside as well, are certain diplococci. The essential feature is a rather peculiar diplo-streptococcus. A photograph of the culture is here given. Inoculation upon the abraded conjunctiva of the rabbit is possible, but the growth soon dies out.

This first case has been deemed specially worthy of record for the reason that there occurred in the same family another case of the same nature, which was given practically the same treatment, but which resulted quite differently. This was a younger sister of the boy, brought with him by the mother in December, 1895, the membrane having then existed in this second patient also for several weeks. With the girl the disease was much more marked. The lids were swollen and œdematous, secretion profuse, and, on everting the lids, the

upper palpebral conjunctiva and part of the lower on both sides was found to be covered with an exceedingly thick yellowish deposit, almost like a piece of chamois skin, two or three millimeters in thickness, which, like that in the boy, projected over the margin of the lids. This growth persisted, in spite of the various forms of treatment adopted, there being slight variations, as when, for a time, there were appearances of improvement, or when it would tend to grow worse. It should be added also that this child has suffered for more than a year from a vaginitis, and for about six months the labiæ are covered with a similar deposit.

March 16, 1897, after the deposit on the conjunctiva had lasted nearly a year and a half, she developed scarlatina, and was transferred to the general hospital. As a complication of the scarlatina, I am told that diphtheritic patches appeared in the throat, the lids became œdematous, the secretion very profuse; that about the 15th of April the cornea became slightly opaque; and when I was called in consultation on the 23d of April I found the necrosis of both corneæ so far advanced as to leave but little hope of any vision.

The bacteriological examination of this case was made with special care by Dr. Ullman several months since, the result being, in a word, that he found then the same diplo-streptococcus which was isolated also by Dr. Thornbury later from the conjunctiva of the boy. The interesting point is, however, that since the girl developed symptoms of diphtheria, several cultures made from the conjunctiva, and also from the vagina, by Dr. Thornbury, and also by the bacteriologists of the Board of Health, showed practically a pure culture of the Loeffler bacillus, and an absence of the forms previously on her conjunctiva, and still on the conjunctiva of the boy.

An examination of the literature of the subject shows, of course, many cases recorded of membranous conjunctivitis, but comparatively few in which a bacteriological examination had been made; and a still less number, and only comparatively recently, can those be found which resemble the cases here given.

These are shown in the accompanying table:

Year.	Where found.	Name of Observer.	Case No.	Sex.	Age.	Duration.	General Condition.	Appearance of Lids.	Appearance of Membrane.	Conjunctiva.	Cornea.	Condition of Globe.	Treatment.	Bacteriological Examination.	Inoculation.	Entire Duration.
1893	Trans. Oph. Soc., United Kingdom.	Adolph Bronner.		male.	43	3 days.		Swollen and red.	Gray-white; opaque membrane, adherent.	Red and swollen.	Hazy.		Removed membrane. Hot fomentations, cocaine drops, perchloride of mercury 1-5000 every half hour, nitrate of silver.			About 5 days.
1891	Archives d' Ophthalmologie.	Dr. Badal.			15 months.	2 weeks.	Bronchitic.	Slight swelling.	Whitish.	Covered with membrane.	Both infiltrated.		Lemon juice, sol. of sub. sol., 1 to 2000; iodoform salve, atropin.	Dr. Auche, within 24 hours, opaque white colonies; these proved to be two forms of micro-organisms — one kind small, well-marked, arranged in chains; the others larger, and irregularly arranged Streptococci; no bacilli.	No record.	9 days.
1893	Archives d' Ophthalmologie.	Dr. Guibert.		female.	7 years.	5 months.	Anæmic, waxy pallor.	Moderately swollen.	Thick and whitish; covered entire portion; 4 mm. thick.	R. E. covered with membrane.	L. perforated, R. ulcerated; afterwards slight leucoma.		Ice applications, instillation of lemon juice, eserine, pyoctiminus, baths of B. A., and carbolic acid, etc.	With Loeffler's stain; no diphtheria bacillus present; with gentian stain, a few cocci cultures on serum showed staphylococcus; on gelose show staphylococci and a colony of stryptococcus; on gelatine staphylococci aurius in great number. This case evidently belongs to both the second and third class of Sourdille: "We must conclude that we have to do with conjunctivitis, due to staphylococci and to struptococci."	No record.	

1681	Archives d' Ophthalmologie.	Gilbert, Sourdille.	1	female.	15 months.	1 month.	Good.	Swollen.	Thick yellow.	Bleeds if rubbed.	Normal.		Frictions with glycerine, with carbolated glycerine, with methyl violet; cauterization with nitrate of silver, 1 to 1000, and Z. S.	Loffler's bacillus short and thick, placed, as it were, parallel to each other, some slightly curved inward.	Inoculation on R. E. rabbit produced slight conj. irritation. On L. E. of rabbit inoculation with these bacilli, at the end of 24 hours, beautiful false membranes covering the whole palpebral conj. These disappeared from the eye of the rabbit in about 5 days.	1 month
1894	Archives d' Ophthalmologie.	Gilbert, Sourdille.	2	female.	3 years.	8 days.	Poor, feverish, and pale.	Much swollen.	Deposit white, shining, opaline.	Thick.	Slight ulceration.		Boric acid.	First on serum white spots, staphylococci, and struptococci; second, agar struptococci.	The struptococcus in cornea and under the skin of a guinea pig produces abscesses, and false membrane develops.	
1894	Archives d' Ophthalmologie.	Gilbert, Sourdille.	3	female.	3 years.	12 days and over.	With fever.	Swollen.	Red, thin, and friable.	Swollen and shiny.	Normal.		Lemon juice, methyl blue, etc.	Diplococci, some bacilli, but no streptococci.	On rabbit grew in 24 hours swelling infiltration cov. false membrane.	
1894	Archives d' Ophthalmologie.	Gilbert, Sourdille.	4	male.	4 years.	3 weeks and over.	With measles.	"Large as an egg."	Not formed at first; after 7 days perceptible, thin, adherent.	Greatly infiltrated.	Perforated both corneæ.		Palliative.	Loffler's bacillus on serum, and also staphylococcus and streptococcus.	On guinea pig after 24 hours, false membrane.	
1894	Archives d' Ophthalmologie.	Gilbert, Sourdille.	5	female, sister of No. 4.	2½ years.	3 weeks and over.	Fever and pallor.	Both swollen. Like No. 4.	Like No. 4.	Like No. 4.	Ulceration of both.		Methyl violet, carbobated glycerine.	Exactly same as last.	Same as 4.	
1894	Archives d' Ophthalmologie.	Gilbert, Sourdille.	6	female, mother of Nos. 4 and 5.		5 days.	Not given.	Slightly swollen.	Thin, friable.	Slightly swollen.	Normal.		Methyl violet, carbobated glycerine.	On serum typical Loffler bacillus. Some streptococci.	On guinea pig gave thin membrane.	
1895	N. Y. E. & E. Inf., Report III, Part 1, page 1.	R. H. Derby.		Girl.	7 years.	3 months imp.; then 2d attack 9 months later; and in 2 months loss of eye.	Good.	Swollen.	Fibrinous, non-adherent, except at one point.	Glassy when non-adherent; granular when adherent.	In first attack vascular at edge; second attack necrotic.	Eye was enucleated.	Boric acid Removal.	Streptococcus in pure culture. Fibrin. Red Corpuscles. Leucocytes.	Memb. in ant. chanber rabbit gave panophthalmitis in 3 days.	

As we regard these various forms of conjunctivitis, we see at once that, while the terms membranous, pseudo-membranous, or diphtheritic indicate the presence of a deposit in the conjunctiva, they mean nothing more, and for that reason should be abolished.

A classification based on the forms of bacteria which thus far have been distinctly and clearly proved to cause such deposits is the only one on which we can rely. This list is probably far from complete, and will need revision; but, as it stands at present, following the plan of Sourdille, to whom most credit is due, and adding the form found in the boy, we have:

First. A catarrhal conjunctivitis, accompanied by an exudate which is movable, non-adherent, and not characterized by a specific bacteria.

Second. Conjunctivitis due to a staphylococcus. This is rather slow in its growth; the membrane is attached to the conjunctiva, which bleeds as the former is removed; and, although the course of the disease is more or less chronic, there is but little tendency to the invasion of the cornea.

Third. Membranous conjunctivitis due to streptococcus. With this the course is rapid, accompanied with more or less œdema of the lids, profuse discharge; the disease is rapid in its course, and there is a tendency to invasion of the cornea.

Fourth. Conjunctivitis from the Loeffler bacillus. With this, like the last, the progress is rapid, accompanied by swelling, profuse discharge, and almost invariably more or less invasion of the cornea, this last class including, of course, the usual cases of diphtheritic conjunctivitis.

As a fifth form, however, we have the case of the boy at present and that of the girl as it was formerly, both of which were dependent upon some diplococcus or strepto-diplococcus. With both of these patients there is a marked tendency to exacerbations of a virulent type, with symptoms simulating diphtheria; and in the girl this developed finally into well-marked diphtheria, with presence only of the Loeffler bacillus, and loss of both eyes.

It is impossible, of course, for the diplococcus to have changed into the Loeffler bacillus, but it is possible, and it is

also common, for other bacteria to so alter their character as to vary in virulence, not only in different individuals, but in the same individuals at different times.

We know, of course, that forms of ordinary streptococci or diplococci are found on the normal conjunctiva, just as the Loeffler bacillus is occasionally found in throats otherwise healthy. Why these forms should exhibit varying characteristics in different individuals, or even in the same individual at different times, is a frequent question of ours, for which bacteriology as yet has no reply. But this group, known collectively as membranous conjunctivitis, is so important that it seems worth while to add even this observation concerning one variety of the disease.

DIPHTHERITIC CONJUNCTIVITIS.

By MYLES STANDISH, M.D.,

BOSTON, MASS.

Last year I read a paper before this society on the importance of having a bacteriological diagnosis in cases of diphtheritic conjunctivitis. The principle brought out was that there were many cases of this disease, which did not follow the classical, clinical picture that we have all called diphtheritic conjunctivitis, and consequently many more destructive processes were diphtheritic than we had hitherto been led to suppose.

Since writing that paper, I have felt much more strongly than formerly the importance of having an early bacteriological diagnosis, for the reason that in my experience in these cases, if they are early treated with antitoxine, they run a much milder course and the cornea is generally saved with resulting preservation of vision.

Moreover, I have come to regard with suspicion rapidly progressing infiltrations of the cornea, unassociated with any very strongly marked conjunctivitis, for upon bacteriological examination in such cases, I have several times found that the pathological process was due to an infection with Klebs-Loeffler bacillus, and I am about to report several cases selected from a number which I have seen during the past year:

The first case illustrates the benefit to be received from an early and persistent use of antitoxine in a typical case of diphtheritic conjunctivitis.

The second illustrates a diphtheritic infection in which the conjunctival disturbance was comparatively slight, and the corneal disturbance severe and rapid.

The first patient was a healthy boy,— three years of age. His eyes were first noticed to be red on the morning of September 21st. He was first seen by me on the morning of September 23d. There was then considerable lachrymation, slight injection of the bulbar conjunctiva of each eye. The palpebral conjunctiva of both lids of each eye was red, swollen, and of a soft, velvety texture, resembling the condition often seen at one stage of trachoma. There was little, if any, pus, and I was at a loss to know just what the condition was. At the end of twenty-four hours, the condition was much the same, but, on the evening of the 24th, the velvety texture had smoothed over somewhat, and I began to have a suspicion of what the condition might be.

The next morning there was a distinct membrane on the conjunctiva of the upper lid of each eye, and the swelling of the lids was so great that they projected nearly half an inch over the lower lids upon the cheek. At noon that day, smears taken from the conjunctiva gave an abundant and pure culture of the Klebs-Loeffler bacillus. The culture tubes were inoculated for further study, which after twenty-four hours in the thermostat gave a very abundant typical growth of Klebs-Loeffler bacilli.

At 3 o'clock on this afternoon, Dr. J. L. Morse, at my request, injected 3½ cubic centimetres of the city of Boston antitoxine — of which a full adult dose is 5 cubic centimetres. By 7 o'clock in the evening, the membranes upon the conjunctiva were shredding off, and the thick, brawny upper lids seemed slightly more flexible. Upon the following morning — the 26th — there was no membrane upon the conjunctiva of the right lid, and on the left lid it all shredded easily off, except a small patch in the center of the upper lid. By 12 o'clock, however, the condition of affairs had changed markedly. The lids were again stiff and boardlike. The conjunctiva was thick with a

brown and brawny infiltration over the tarsal surfaces and a thick membrane had reappeared over large areas. There was also a patch of membrane 3 millimetres in diameter on the bulbar conjunctiva at the sclero-corneal margin of the left eye. Meantime, five cubic centimetres of antitoxine had been given at 10 o'clock. By 3 o'clock in the afternoon the condition of the lids had again greatly improved; they were soft and almost flexible. The membrane was only hanging by shreds to the conjunctiva and the condition was practically the same as that on the night before. This improvement continued throughout the night, but by 12 o'clock on the next day the stiffness had again returned to the lids and a thin bluish membrane covered both upper lids, running back behind the retro-tarsal fold for the first time.

The patch of membrane had returned at the sclero-corneal margin, and the epithelium had peeled off the cornea over an area of 3 or 4 millimetres in diameter contiguous to the patch of diphtheritic membrane in the conjunctiva. The following morning, the margin of the area where the epithelium was denuded became distinctly infiltrated and the whole denuded surface of the cornea was opaque. It then became apparent to me that the antitoxine in this case exerted an immediate and favorable effect upon the progress of the disease; that this effect was well marked in 4 or 5 hours after the antitoxine had been injected, but at the end of 20 hours there had been in each instance a recrudescence of the pathological process; therefore, it seemed to me logical, in order to control the disease absolutely, that injections should be made in this case, at least once in 16 hours. Accordingly this was done, and 3 cubic centimetres of antitoxine were injected every 16 hours from the 27th of September until the 30th — in all 9 injections. From the time when this treatment was instituted, the eyes progressively recovered. The membranes shredded off; the brawny infiltration no longer returned. The epithelium was replaced on the cornea before the last of the membrane sloughed out of the conjunctiva of the upper lid, which occurred about 5 o'clock on the afternoon of September 30th, leaving a deep, well-defined ulcer.

The eyes made a rapid recovery, and there was no leucoma

left on the cornea at the seat of the lost epithelium and subsequent infiltration of the corneal tissue. October 4th a profound urticaria appeared, which lasted 48 hours. As that subsided there was a sudden rise of temperature with considerable loss of strength and drowsiness, which continued 6 days, after which the child made a rapid convalescence. It is, perhaps, worth while to state that there was no albumen in the urine at any time.

The local treatment consisted of cold applications to the lids, and an ointment of the red iodide or yellow oxide·mercury, to which was added one-half per cent. pilocarpine after the cornea became infected, a lotion for the purpose of cleanliness, and a bland ointment on the lids after each cleaning.

The second case illustrates a diphtheritic infection in which the conjunctival disturbance was comparatively slight and the corneal disturbance severe and rapid. It is that of a young woman 27 years of age — a domestic — who came to my office on the 30th of November, 1896, and reported that while her eyes had always given her more or less trouble, they had been quite well for a year or more, until two or three days before coming to me, when lachrymation appeared accompanied by some redness. The condition of her eyes upon examination was found to be as follows:

The bulbar conjunctiva of each eye was injected and the lower conjunctival cul-de-sac in the right eye was markedly injected and perhaps slightly infiltrated. The conjunctiva of the upper lid was not markedly injected and comparatively normal in appearance.

At the margin of the cornea above there were several elevations of the conjunctiva each about two millimetres in diameter infiltrated and resembling in general appearance large phlyctenules, except that there was no pustule present. There was a large superficial ulceration with a very gray base, covering about one-half of the cornea lying contiguous to the small infiltrated conjunctival patches. An ointment of red iodide of mercury and atropine was given, and the patient seen again on December 2d, when the patches of infiltration above the ulcer seemed to be about the same.

On the next visit, December 7th, there was a very small amount of muco-purulent discharge, characterized by broad flakes of mucus filled with pus, which appeared to be slightly attached to the sclero-corneal margin in each case. The corneal tissue at site of the ulcer was much whiter in appearance and seemed to be deeply necrotic. In the other eye, while the infiltration of the conjunctiva of the lids was very slight, if any, several of these rounded elevations of infiltrated tissue had appeared in the bulbar conjunctiva somewhat resembling in gross appearances large phlyctenules.

The patient was advised to enter the Carney Hospital, and did so on the following day. Cultures were taken from the conjunctival sac, but owing to the fact that it was unskillfully done by the house officer, the tubes became infected with bacillus foetidus and the result was consequently negative.

On the morning of December 9th, the condition of the right eye was as follows:

There was a brawny, dense infiltration of the conjunctiva practically surrounding the cornea. The appearance resembled that of a burn of the conjunctiva with hot metal. There was no swelling of the lids; no infiltration of the palpebral conjunctiva; no membrane upon either bulbar conjunctiva or palpebral conjunctiva. A grayish infiltration of the corneal tissue appeared at the lower portion of the cornea and there was hypopyon in the anterior chamber.

The necrotic tissue was touched with tincture of iodine and an ointment of red iodide of mercury used.

In the left eye various dense infiltrations of the cornea appeared opposite the conjunctival elevations before spoken of as resembling phlyctenules and new cultures were made from each eye by Dr. Wm. J. Daley, Assistant Surgeon. Twenty-four hours later these showed abundant growths of Klebs-Loeffler bacilli. Antitoxine was ordered, but the hospital authorities, becoming alarmed, transferred the patient immediately to the new hospital for contagious diseases — in the southern department of the Boston City Hospital — here the bacteriological diagnosis was confirmed. At the time of the transfer of the patient, large areas of both corneæ looked deeply necrotic and it seemed

to me that there could be no other result than a total loss of the cornea of each eye; nevertheless after two injections of antitoxine the corneal process stopped and only one small perforation occurred. Large areas of the cornea cleared up entirely, although there were several dense cicatrices left on each eye.

From this case, it will be seen that a most rapid and destructive corneal ulceration occurred from a localized diphtheritic conjunctivitis on the bulb, while at the same time, there was absolutely no diphtheritic infection of the conjunctiva of the lids.

Nor has this case been unique in my experience during the past year. I have seen three others — notes of which I have not at hand — but in which the sloughing ulcer of the cornea was the principal process, with no infiltration or swelling of the lids and only slight localized infiltration of the conjunctiva contiguous to the ulceration, in which cultures showed that the Klebs-Loeffler bacillus was undoubtedly the pathological agent, producing ulceration of the cornea. In all these cases injection of antitoxine arrested the necrosis of the cornea.

A third case, which is interesting to report in this connection, is that of a boy, eight years of age, who was admitted to the Massachusetts Charitable Eye and Ear Infirmary on the 22d of April. There was great swelling of both upper lids, so that they projected markedly over the lower lids. There was a brown, gray, brawny infiltration of the conjunctiva, so that the lids were stiff and boardlike. This infiltration extended up into the bulbar conjunctiva to the margin of the cornea; there was a slight watery discharge slightly tinged with pus, but no shreds of mucus.

This case presented very much the typical picture of diphtheritic conjunctivitis, yet smears taken from the conjunctival sac revealed gonococci and no Klebs-Loeffler bacilli. No growth appeared in the culture tubes.

From these cases and others, which I have seen within the past year, I have arrived at the following conclusions:

1st. In all cases of purulent conjunctivitis, the diagnosis should depend upon the bacteriological infections, and not upon the clinical appearances.

2d. That diphtheritic conjunctivitis may be present in localized areas without the conjunctiva being affected as a whole.

3d. That ulcers of the cornea with exceedingly rapid necrosis of the corneal tissue may be due to infection with the Klebs-Loeffler bacillus.

4th. That antitoxine favorably affects both the conjunctival disease and the corneal necrosis.

DISCUSSION.

BOSTON MEDICAL LIBRARY FEB 2 1900

DR. J. E. WEEKS, New York: I wish to express my thanks to the gentlemen who have read these papers, Drs. Howe and Standish. Certainly they are in the right direction. We should, I think, base our classification of diseases of the conjunctiva and ulcerative diseases affecting the cornea on a bacteriological foundation. I have advocated this for years, and think it is the only proper classification to employ in these cases. In regard to the paper of Dr. Howe I wish to speak of the case referred to by him, which occurred in the practice of Dr. Derby and in which I made the bacteriologic examination. The case extended over about three months and affected both eyes. The pseudo-membrane formed on the palpebral as well as the ocular conjunctiva and persisted in spite of every form of treatment then known. The disease in the right eye, which was the first affected, began apparently in a small abscess above the lachrymal sac. The conjunctiva became reddened, a pseudo-membrane formed which was very much adherent and left a bleeding surface when removed, and returned again within a few hours. After some months the cornea became involved and the eye was destroyed. The disease in the other eye ran a very long course, but finally the pseudo-membrane disappeared without destruction of the cornea. I made the bacteriological examination and failed to find the Klebs–Loefler bacillus at all, but found a streptococcus, which, when inoculated in the rabbit's eye, produced rapid destruction. I think that pseudo-membrane of the conjunctiva should be classified as Dr. Howe suggested. We have pseudo-membrane in some cases wherever the epithelium is destroyed. We have it in the muco-purulent conjunctivitis, in which a small bacillus has been described; we have it in conjunctivitis due to gonococcus; we have it as you all know in conjunctivitis due to diphtheria, which, happily, is very rare, and we have it in the other forms mentioned by Dr. Howe. I do not believe that we can determine to which form, or rather to what class, we shall relegate any one case until we have examined the secretions bacteriologically.

I think that in certain parts of the country diphtheria must be very much more prevalent than in others, because although I have examined the secretions in many cases of conjunctivitis, I have failed to find the bacillus in all but a few cases in New York.

DR. HOWE. — These cases have interested me greatly. In reference to the case which Dr. Weeks has been discussing, if I read the report right the case lasted three months and then was discharged practically well, but returned nine months later and two months after that there was destruction of the cornea and a condition which necessitated enucleation. In regard to the inoculation, if I remember rightly, he did not inject a pure culture but introduced a piece of the membrane into the anterior chamber of the rabbit's eye and that resulted in loss of the eye.

DR. G. E. DE SCHWEINITZ, Philadelphia. — My experience with conjunctivitis caused by the Loeffler bacillus has not been an extensive one, but I have seen one case which exactly confirms one of the observations made by Dr. Standish, namely, that with only a moderate amount of membranous deposit upon the conjunctiva, there may be rapid corneal involvement. The diagnosis of this case rested upon bacteriological examination. I regret to say antitoxin was not used. The source of infection was probably from association with cases of membraneous rhinitis of diphtheritic origin.

CREDÉ'S METHOD FOR THE PREVENTION OF PURULENT OPHTHALMIA OF INFANCY IN PUBLIC INSTITUTIONS.

BY LUCIEN HOWE, M.D.,
BUFFALO, N. Y.

In order to appreciate the importance of this subject, it is necessary to recall very briefly the number of persons in this country who have been made blind by purulent ophthalmia of infancy, and also to estimate their cost to the state. In 1890 there were in the United States 50,411 blind persons of all ages. Now, it will be remembered that Magnus and others who have studied carefully the causes of blindness among several thousand individuals of all ages, found that in about 10.8 per cent. this condition was due to this ophthalmia neonatorum. Or, if we call that 10 per cent. for the sake of moderation, we have in this country, in round numbers, at least five thousand persons blind from that disease. If the average cost of these per capita is about that of paupers, that is, about one hundred and twenty-five dollars per year, this means that the country expends for them about $625,000 annually. Now if it were possible within one generation to reduce the number of those blinded by the disease in question from 5,000 to less than 350, and then indirectly to only twenty or twenty-five in all, by the invariable use of one remedy which could be used by any intelligent nurse, and which is practically perfectly safe, then it would seem worth while to use that one remedy invariably, at least until there were reasons for changing to a better one. Or, on the other hand, if the neglect of this remedy imposed an unnecessary cost upon the state, to say nothing of the suffering of the victims of such negligence, it would seem that it was the right and duty of the state to enforce such treatment.

Now the first object of this paper is to show that the application of a single drop of a two per cent. solution of silver nitrate to the eyes of children as soon as possible after birth, as recommended by Credé, is the best means thus far known for preventing this purulent ophthalmia of infants. Also, that a large experience proves that when no such precautions are taken, about fifteen times more children develop that disease than

when the nitrate of silver is used. It is not contended here that this treatment should be enforced invariably in private practice, however strong the reasons for that may be, but some reasons are given why, in all institutions supported by public funds, this should be made obligatory, either by general state law or by local regulations.

As to the first question, concerning the comparative value of silver nitrate and of other remedies, that is not a matter of theory, but simply a question of fact established by the combined experience of a large number of obstetricians whose unusual opportunities for observation, both in institutions and elsewhere, have made them most competent to speak on this point. Of all the numerous statistics and published opinions which have been gathered at various times by different authors, the most recent and complete lists relating to this important matter were published last year in the *Archives für Gynækologie* by Kostling of Halle.

The accompanying table is made from his lists, and includes all the writers who state the number of children who came under their observation, and also the percentage of those who developed ophthalmia of infancy:

STATISTICS CONCERNING THE FREQUENCY OF PURULENT OPHTHALMIA OF INFANCY BEFORE THE USE OF THE CREDÉ METHOD.

	No. of Cases observed.	Percentage of Ophthalmia Neonatorum.	
Credé, Leipzig, 1874–80, . .	2,266	9.97	Arch. f. Gyn. XVII, S. 50.
Grenser, Dresden, . . .	2,801	13.6	Haussmann, Deutsch. med. Wochenschr., 1879.
Osterloh, Dresden, . . .	1,106	10.5	" " "
Winckel, Dresden, . . .	1,029	15.4	" " "
Ahlfeld, Marburg, 1867 to 1882,	2,191	5.2	Zeitschr. f. Geb. u. Gyn., XIV.
Haidlen, Stuttgart, 1877 to 1880,	1,476	11.65	Centralbl. f. Gyn., 1883.
V. Säxinger, Tübingen, . .	1,980	6.1	V. Säxinger, Mittheil. aus d. geburtsh. gyn. Klinik zu Tübingen, 1884.
Dethlefsen, Kiel, 1872 to 1882,	1,212	10.31	Diss. Kielr, 1885.
Dyrenfurth, Bresl., Hebammen-Anstalt, ...	1,039	18.5	Haussmann, Deutsch. med. Wochenschr., 1879.
Konigstein, Wien, 1881, . .	1,092	4.76	Allg. Wien med. Zeitg., 1882.
C. Braun, Wien, . . .	290	7.2	Haussmann, Deutsch. med. Wochenschr., 1879.
" "	260	4.0	" " "
Artemieff, Tiflis, 1873–83, .	1,025	2.9	Arch. de Tocologie, 1887.
	17,767	9.24	

TABLE NO. II.—STATISTICS CONCERNING THE FREQUENCY OF OPHTHALMIA NEONATORUM AFTER THE USE OF THE CREDÉ METHOD.

	No. of Cases observed.	Percentage of Ophthalmia Neonatorum.	
Credé, Leipzig,	1,160	0.086–017	Arch. f. Gyn., XXI.
Zweifel, Leipzig,	1,724	0.2	Lehrb. d Geburtsh. III Aufl.
Leopoldu. Wessel, Dresden,	1.002	0.69	Arch. f Gyn.. XXIV.
" " "	1,100	0.0	Centralbl. f. Gyn.., 1885.
" " "	522	0.0	Arch. f. Gyn.. XXIV.
Brose, Berliner Frauenkl.,	460	1.5	Zeitsch. f Geb. u. Gyn.. X.
Gusserow, Charite,	1,110	0.45	Korn. Arch. Gyn.. XXXI.
Hummerich, Charite,	1,007	1.39	Ref. Centralbl. f. Gyn., 1885.
Haidlen, Stuttgarter Hebammenschule,	978	0.1	Centralbl. f. Gyn., 1883.
Bayer, Stuttgarter Hebammenschule,	361	0.0	Arch. f. Gyn., XIX.
Krukenberg, Bonn,	703	0.56	" " XXII.
Kaltenbach,	234	0.85	Nebel, Zeitchr. f. Geb. u. Gyn., XIV.
Feis, Gottingen,	452	0.0	Centralbl. f. Gyn., 1892.
Caro, Konigsberg,	1,254	1.44	Diss. Konigsberg. 1887.
Beumer u. Peiper, Griefswald,	109	1.7	Arch. f. Gyn., XXIII.
" " "	107	1.9	" " "
Karafiath, Budapest,	130	0.0 -0.72	Ref. Centralbl. f. Gyn.. 1884.
Konigstein, Wien,	1,300	knapp 1.0	Allgem. Wiener med. Zeitg, 1882.
Felsenreich, Wien,	500	0.4	Arch. f. Gyn., XIX.
" "	3.000	1.93	" "
Konrad, Grosswardein,	714	0.14	Ref. Centralbl. f. Gyn., 1889
Artemeiff, Tiflis,	153	0.6	Arch. de Tocologie, 1887.
" "	204	0 3	" "
Mendes de Leon, Amsterdam,	870	0.8	Ref. Diss. Fleischhauer, Halle, 1884.
Budin, Charite, Paris,	675	0.15	Arch. de Tocologie, 1892, p. 877.
Riviere, Bordeaux,	403	0.5	" "
Vinay, Lyon,	400	0.0	Puech. Arch. de Tocologie, 1890, p. 72.
Garrgues, New York,	351	0 0	" " "
Charles, Luttich,	377	0.265	Ref. Centralbl. f. Gyn., 1888.
Fehling, Basel,	3.002	0.19	
Fehling, Halle,	361	0.83	
	24,724	0.655	

ONE PER CENT. SOLUTION OF SILVER NITRATE.

	No of Cases observed.	Percentage of Ophthalmia Neonatorum.	
V. Hecker, Munich,	133	3.0	Archives f. Gyn., XX.
Schmitt and V Weckbecker-Sternfeld, Munich and locality,	1,090	1.844	Centralbl. f. Gyn., 1883.
	1,223	2.422	

TABLE III.—CARBOLIC ACID SOLUTIONS.

	No of Cases observed.	Percentage of Ophthalmia Neonatorum.	
Konigstein, Wien,	1,541	2.0	Allg. Wien med. Zeitg., 1882.
Krukenberg, Bonn,	82	13.4	Arch. f. Gyn., XXII.
	1,623	7.7	

SUBLIMATE SOLUTIONS.

	No. of Cases observed	Percentage of Ophthalmia Neonatorum.	
Stratz, Berl. Frauenklinik,	965	0.6 (0.1 per ct. sol.)	Centralbl. f. Gyn., 1885.
" " "	460	0.43 (0.02 per ct. sol.)	" " "
Fritsch, Breslau,	486	0.4 (?)	Stratz, " "
V. Erdberg, Dorpat,	450	0.43 (Sublim. 1: 7000	Diss. Dorpat, 1892.
	2,361	.47	

STERILIZED WATER.

	No. of Cases observed.	Percentage of Ophthalmia Neonatorum.	
Abegg, Danzig,	2,266	3.0	Arch. f. Gyn., XVII.
Schirmer, Erlangen,	50	0.5	Centralbl. f. Gyn., 1882.
Grünewald, Petersbg.,	485	1.66	Monographie, 1884.
Kattenbach, Halle,	85	1.176	Nebel, Zitschr. f. Geb. u. Gyn., XIV.
Cohn, Berl. Frauenkl.,	200	4.0	Centralblat. f. Gyn., 1886.
" "	653	1.9	" " "
Korn, Dresden,	1,000	0.7	Arch. f. Gyn., XXXI.
" "	95	6.0	" "
Hofmeier, Wurzburg,	354	0.28	Munchen med. Wochenschrift, 1890 (1 case of corneal ulcer among these).
Mermann, Mannheim,	400	0.25	Centralbl. f. Gyn., 1892.
" "	200	1.0	" "
Riviere,	35	17.0	Arch. de Tocologie, 1892, p. 877.
	5,823	3.122	

IODIDE TRICHLORIDE.

	No. of Cases observed.	Percentage of Ophthalmia Neonatorum.	
Buchholz, Dorpat, 1, 4, '92, to 1, 4, '93,	201	1.0	Diss. Dorpat, 1893.
Keilmann, Dorpat u. Breslau,	500	1.4	Schles. Gesellschaft fur vaterl. Cultur., 25, 1, '95.
	701	1.2	

From these tables it will be seen that we have here the results of various treatment in over 54,000 cases, and they are divided as follows:

17,767	births	with no treatment,	9.2	per cent. of ophthalmia of infancy.
24,724	"	2 per cent. solution of silver nitrate,	0.65	per cent.
1,223	"	1 " " "	2.4	"
1,623	"	carbolic acid solutions,	7.7	"
965	"	0.1 per cent. solution of sublimate,	0.6	"
1,396	"	other sublimate solutions,	0.4	"
6,155	"	sterilized water,	2.8	"
701	"	iodide trichloride solutions,	1.2	"

It will be seen that previous to the introduction of Credé's method the records of over 17,000 births, tabulated by thirteen observers, showed that over nine per cent. of the children developed ophthalmia neonatorum. On the contrary, after the introduction of Credé's method, the records of over 24,000 births, tabulated by thirty-one observers, showed only .65 per cent. In other words, the proportion was nearly 15 times more frequent without the Credé method than with it. Attempts have naturally been made to obtain the same results with other agents, and the relative success with these is shown in Kostling's list. It will be seen that all of these methods give a larger percentage of ophthalmia than does Credé's method, with possibly the exception of solutions of sublimate. A digression might be made here to show why this last treatment is inferior to that suggested by Credé. The stronger solutions, like a tenth of one per cent., are very irritating to the conjunctiva, and obstetricians like Widmark, Fleischhauer, and Olshausen, after extensive trials, have abandoned all sublimate solutions to return again to the silver nitrate. Therefore, until the evidence of those

who have used sublimate is more abundant and more favorable, that must also give way, leaving no form of treatment with a record of efficiency equal to that of the two per cent. silver nitrate.

But are there not objections to the plan recommended by Credé? Yes, and if these objections are stated in turn, each with its full force, and the natural answer to it is considered, it will at once appear how weak these are in comparison to the reasons for still keeping to that method.

Objection I.— The first and most important objection is the mere doubt in the minds of some, as to whether or not a two per cent. solution of silver nitrate may not in some way be harmful, possibly dangerous. The simple reply is that it is not. When a single drop of the solution is used, as recommended by Credé, the procedure is practically as free from danger to vision as any treatment can be. The fact is, that among the 24,724 records of births collected by Kostling where the obstetricians have used the two per cent. solution of silver nitrate, and among the many more thousand births probably in which the same solution was used and in which any bad results would have been promptly published if they had occurred,— among all these it is possible to find reference to only four cases in which any disagreeable effects could be attributed to this method. It should be remembered, also, how much care has been given to ferreting out any such cases of injury from silver nitrate. For example, in order to gather data on this point (as well as others relating to ophthalmia of infancy), Cohn sent a letter to the leading ophthalmologists of Germany asking, among other questions, if any unfavorable results of the use of Credé's method had come under their observation. He received replies from one hundred and ten of the heads of ophthalmic clinics and others with whose names we are most familiar, and among them all discovered only two cases in which there was even a question as to the disadvantages of the method. In both of these it was asserted that ulceration had followed the application of "drops" immediately after birth, but in neither instance was it possible to ascertain the strength of these "drops" nor how often they had been used.

Two other cases have occurred, both in this country. One is published by De Schweinitz in the *Medical Record* of 1891, and the other by Pomeroy in 1887. Both of these presented the rather peculiar feature of bleeding following the application of the silver nitrate. In De Schweinitz's case a two per cent. solution was used first, and after that one of four per cent. As this would never be applied by any one following the Credé method, it should be excluded from the present category. There remains only the case reported by Dr. Pomeroy. With this child only a drop of a two per cent. solution was used, but there followed "a slow, persistent oozing of blood, startling to observe." There is every reason to suppose that the child was one of those individuals with a natural tendency to bleed easily. Indeed, among so many thousands or perhaps hundreds of thousands of children thus treated it would be strange if some such bleeder from usually insufficient cause were not met with. It should be remembered, also, that nearly every remedy which has been proposed to take the place of silver nitrate has been followed by disagreeable results; even after the use of sterilized water some irritation, and once at least corneal ulceration, has followed (Hofmeier), probably due as little to the water as the other cases were to the silver nitrate.

Objection 2. If not dangerous, it is at least painful. No, that is not necessarily the case. Since Credé's first article on the subject cocaine has been given to us. Of course it is impossible to use cocaine first and immediately after apply the silver nitrate, as a precipitate would be formed, but it is possible to inject first a few drops of cocaine, and though the tears at once wash this out the anæsthetic effect remains, and if the silver be used then the pain produced is but very slight.

Objection 3. The procedure does not invariably prevent the disease. It is true that in a very small percentage of children the remedy is ineffective, and in spite of it they develop the disease. In the list of more than 24,000 cases treated thus, 0.65 had the ophthalmia. But is not that degree of efficiency quite as high as that of other drugs which we call specifics? By the same reasoning we would have to give up

opium, quinine, and many of the most valuable remedies that we have.

Objection 4. It requires extra care on the part of the obstetricians. But what is the obstetrician employed for, if not to give the child the best attention possible?

Objection 5. Some discomfort and possibly some pain is given to the children, with consequent anxiety to the parents. In a word, the child is put to some inconvenience. But which would the child prefer, such inconvenience or the possibility of lifelong blindness? And as to the parents, they have only reason to congratulate themselves that a method is now known whereby we are assured of the practical safety of so many of the eyes formerly sacrificed. These objections then resolve themselves into the question as to which is worse, annoyance to the physician and to the children, or lifelong affliction like this, though it be to comparatively few. It must be admitted that the method recommended by Credé is far from perfect, and not always reliable. A better one may be found to-morrow. But thus far, in the opinion of those most competent to judge, it is the best.

But admitting all this, why should it be made obligatory either by general state law or by local regulation? There are several reasons for this.

The first is the right which the state has to protect itself against unnecessary taxation. Children born in public institutions are specially under its care. It has as much right as an individual, to say what treatment they shall have, and if Credé's method is the best now known, these children should invariably have the benefit of it. If a better method is discovered, as it may be, it would be easy enough to change the regulation or the law.

Second, it is the duty of the state to compel the use of this one exclusive method of treatment, which experience has proved the best, for the same reason that it is its duty to enforce vaccination. The danger from contagion is, of course, much less, but when we remember that these blinded individuals must be dependent almost invariably for their support for a whole lifetime, the cost in the end is greater than that caused by small-pox.

A third reason is that obstetricians have shown themselves slow to adopt this or any other plan for the prevention of purulent ophthalmia. The truth is, as shown by May, that about as many cases of this disease are recorded in hospital reports now as there were ten or fifteen years ago. There is also reason to think that some teachers of obstetrics do not lay sufficient stress on the necessity of preventive treatment. Burnett says that "In more than thirty standard works on obstetrics in English in the library of the Army Medical Museum there were only four which considered the preventive measures of which we have spoken." These were the *Encyclopædia of Obstetrics and Gynæcology*, and the treatises of Barnes, Lusk, and Cazeaux and Tarnier. In only six others, and they were mostly old works, was there any consideration given to the treatment of this disease when once it had been established. In spite of all that has been written many obstetricians still confess that they use such precautions seldom or never, and so children continue to increase the army of victims made blind by carelessness or ignorance.

But it happens in certain instances that the practitioner is morally sure that no such source of contagion exists on the part of the mother, and it is naturally asked whether the child of such a mother should be given even a little pain or discomfort and the parents caused any anxiety by the redness of the eyes. The reasoning is perfectly good. But in such cases it is better for the physician to take the responsibility himself and pay the fine for breaking the law, if he must do so, than not to have any such provision at all. Laws must be made for the average and not for exceptional individuals. It will be observed that the reasons given for making the method obligatory apply not only to public institutions but with equal force to private practice. That would be the logical result, and I shall mention, in passing, the enormous advantage gained if the Credé method or some one equally efficient were thus made universally obligatory. For the present, however, it is better to attempt only to make this apply to public institutions, and for the following reasons:

First. It would probably be impossible to inaugurate such

a universal system at once. The American citizen usually objects to the parental form of government, and wishes to have his own children treated in his own way, even if that is the very worst.

Second. If the method is established in public institutions first, the laity will gradually learn its advantages and be apt later to ask that their children receive as intelligent treatment as is given to paupers.

Third. It is better to restrict the treatment to public institutions, for the reason that an opportunity is still left in private institutions and private practice for experimenting with other methods whenever the obstetrician is so inclined and the parents are willing to permit it.

It is true that if Credé's method were made obligatory in public institutions only a very small part of the population would be affected by it, but if that led, as it probably would, to its universal adoption, it is easy to calculate how great the gain would be in the end. We have already seen that a moderate estimate places the number of blind from this disease in the United States at a little over 5,000, but if the Credé method or some other equally effective were invariably used, that number would be reduced in one generation to about 331, or, say, 350 at the outside. Now it is also shown by the reports of a large number of ophthalmic hospitals (Cohn) that when these cases, already fully developed, but without ulceration, have the benefit of methods of treatment now well known, only about five per cent. of them progress to ulceration with consequent impairment of vision. It is probable that most of such cases would be seen in this early stage, not only because of the attention of the public being directed to the importance of the subject by this law, but also because there already exists another law which compels midwives to report these cases to some qualified practitioner soon after the condition is recognized. This latter law already exists in thirteen states having a population of over 34,000,000. If, now, in another generation only about three hundred and fifty children or less developed the disease at all, and if these received proper attention at an early stage so that only five per cent. of them had ulceration of the cornea, there would be, as is evident, not

5,000 cases, as we have now, but only about seventeen or eighteen cases in the whole United States, with the corresponding lessening in suffering and cost. Of course this is only an estimate, and it makes but little difference whether it be eighteen or twenty or twenty-five; the practical fact is that an enormous reduction would be possible. So great would this be as practically to realize for this country what Cohn quotes from Prof. Dimmer as the concluding sentence of his recent exhaustive monograph on the subject, namely: "*Purulent ophthalmia of infancy can, and must be, wiped out of every civilized country.*"

So much for the advantage of Credé's method, and why it should be obligatory, at least in public institutions. Two words more should be added concerning the attitude of the profession in regard to making it obligatory. One of these concerns the obstetricians and the other the ophthalmologist.

As to the obstetrician, those who do use it in institutions would probably have no objection to making it obligatory there until some better method were found.

On the other hand we often meet a practitioner whose experience is comparatively small, generally without the advantage of practice in institutions, who reports having attended a few hundred cases,—number usually indefinite,—during a certain period of years, and, having met with but one or two instances of ophthalmia of infancy, and he demands indignantly why, for that small number, so many should be subjected to such great inconvenience. The evident reply is that either his experience has been exceptionally fortunate or that the bad results have been omitted or forgotten. The blind asylum too often has records of his cases, and obligations, legal or otherwise, should be imposed to control just the class of which he is a type.

Finally, it would seem that a great responsibility as to this question rests on ophthalmological societies and on individual ophthalmologists. For the one who places any obstacles in the way of this much-needed reform owes it to himself as well as to the profession to state clearly the reasons for this, if indeed any can be found, after he has really studied the question thoroughly. The subject of the prevention of blindness from ophthalmia neonatorum has been carefully considered by the Ophthalmo-

logical Society of the United Kingdom, by the Ophthalmological Section of the International Medical Congress of 1890, and by the Societé Francaise d'Ophthalmologie. American practitioners in this department cannot be tardy in calling the attention of their professional brethren to this much-needed reform. I think, too, that even the evidence which it is possible to produce in a brief sketch like this, is sufficient to show that if legislators will compel obstetricians in public institutions to employ this method invariably, it will prove to be the first step in a decided progress toward the relief of misery, and the lightening of an unnecessary burden to the state.

REPORT ON A NEW OPERATION FOR PROTHESIS IN CASES OF CICATRICIAL ORBIT.

By GEO. C. HARLAN, M.D.,

PHILADELPHIA, PA.

The preparation of an orbital cavity for the reception of an artificial eye, when contraction of the conjunctival sac and the formation of cicatricial bands make it impossible for the patient to wear one is admitted to be a difficult and too often hopeless undertaking. Incisions made to admit the shell invariably cicatrize from below, with the result of reproducing, if not of increasing, the contraction; and the transplantation of the conjunctiva of a rabbit, the skin of a frog, or a Thiersch's graft has been followed only occasionally by success. The well-known fact that a discouragingly large proportion of operations undertaken for this purpose have failed, may justify this report of an attempt in a new direction.

The failure to overcome these cicatricial contractions by simple incision is due to the absence of a sulcus and the hopelessness of the attempt to prevent the cicatrizing of a fresh wound that can heal from the bottom. We see this well illustrated in symblepharon, which is comparatively easy to deal with if it is only "anterior," — if a probe can be passed behind

the adhesion, between it and the ball, but offers serious difficulties if it is "total"; and the proceeding that I wish to recommend is based on the same principle as a plan suggested by Himly for the formation of an artificial conjunctival cul-de-sac in the treatment of symblepharon. The problem seems to be the formation of an artificial sulcus, which I undertook in the following case:

T. L., a healthy young man, applied to the Eye Department of the Pennsylvania Hospital to have his orbit prepared for an artificial eye. About eight years before the sight of his right eye had been destroyed by a severe lime burn, which had also caused extensive adhesions between the ball and the eye. Two plastic operations had been performed in unsuccessful attempts to relieve the symblepharon, and the eye had finally been enucleated at the Wills Hospital. The cul-de-sac was much contracted and the lids were so drawn back into the cavity by numerous dense cicatricial bands that their margins could be separated less than a centimetre. The case seemed an unusually discouraging one. No attempt had been made to insert an artificial eye, and I advised the patient not to make one, explaining to him that it would be almost sure to fail, and remarking to my assistants that I had given up all efforts to remedy such a condition a good many years ago. The patient, however, was so urgent to have a trial made, and so ready to undergo any inconvenience in the hope of getting rid of a deformity which interfered seriously with obtaining employment, that I consented to make the experiment.

I remembered having seen in the earlier days of my professional life, when the use of setons was quite common, several cases in which the threads or tapes had been left in place too long and the walls of their track had cicatrized, or "skinned over," forming a sinus that could not be made to close, and could be got rid of only by dissecting it out. Acting upon the suggestion of these cases, I inserted a heavy lead wire beneath the cicatrical bands, passing it around the bottom of the cavity and bringing the ends together to form a ring. Way was made for the wire with a fine pair of sharp-pointed scissors curved on the flat, and it was inserted behind the lower band, brought out

at the outer canthus, re-introduced and passed in the same way above. I showed the patient with the wire in position to the Ophthalmic Section of the College of Physicians, and the gentlemen who saw him will, I think, admit that the case might be considered hopeless under any other known treatment. The wire was worn without inconvenience for about two months, when I cut down upon it and found its track apparently cicatrized, and the upper sulcus entirely satisfactory. The lower sulcus was rather shallow and was deepened by re-introducing a wire. A thin, leaden shell, formed so that its edges would rest where the wire had been, was afterwards introduced and left in position constantly, excepting frequent removal for cleansing of the orbit with boric solution. At the suggestion of one of my assistants, Dr. Schwenk, two holes were made in it for the escape of the discharge. After this had been worn for a few weeks an artificial eye was introduced without difficulty, and the patient returned to his home in a distant town. Six months later, he broke the eye and came to Philadelphia for a new one, when we found an unusually clean and healthy cavity, with no sign of contraction. The cosmetic result is excellent, as is shown by this photograph.

Since then I have operated on two other cases which promise to be completely successful, though sufficient time has not yet elapsed to report them permanently so.

W. J. M., 23 years of age, was injured eight or nine years ago by the explosion of a pistol cartridge, which destroyed the right eye. The ball was enucleated three weeks later. He wore an artificial eye for a year or more, and then broke it and got another which he used for six months, when the socket became sensitive and painful, and finally contracted so that the eye could no longer be inserted. There was a broad cicatricial band at the outer canthus involving the temporal half of the lower lid and a fourth of the upper, and the whole conjunctival sac was contracted.

The lead wire was inserted, as in the other case, on January 21, 1897, and was cut down upon and removed, and the leaden shell was introduced on March 30th. He is now wearing a very natural-looking artificial eye.

C. L. S., aged 29, lost his right eye by a gun accident thirteen years ago, and it was enucleated a year later on account of sympathetic trouble in the other. A month after the operation an attempt to insert an artificial eye failed. The bands were cut and an artificial eye was inserted and left in constantly for two weeks, when it could not be replaced. Another operation which was followed by excessive bleeding was performed, but the eye could not be introduced. There was a dense cicatricial band involving a third of the upper lid, and a broader one involving the lower. The whole conjunctival sac was contracted and the smallest artificial eye could not be introduced.

The wire was inserted December 17, 1897, and the leaden shell was substituted on March 15th. Granulations sprang up on each side of the track of the wire, requiring repeated cauter-

ization with nitrate of silver, but the track itself remained firmly cicatrized and smooth. This sketch, considerably enlarged, shows the wire in place. As the lower lid was lacerated

at the time of the original injury and a slight ectropion has resulted, it may be necessary in this case, as in the first, to further deepen the lower sulcus, and perhaps to cut out a wedge from the lid margin.

Our leaden shells seemed to be so much better borne for the openings that were made in them, that Dr. Schwenk has since had holes bored in artificial eyes; as he believes that the irritation, congestion, and oedema, so frequently found in the socket of an artificial eye may be due in part to the formation of a vacuum behind in the shell and the forcing of its edges against the tissues by atmospheric pressure, as well as to the accumulation of secretions.

AN IVORY EXOSTOSIS OF THE ORBIT.

BY W. F. NORRIS, M.D.,

PHILADELPHIA, PENN.

H. M. B., aged 24, a tin roofer by trade, came to the Hospital of the University of Pennsylvania February 24, 1896, complaining of a hard lump which was growing from the inner wall of the right orbit. He had noticed the tumor for six years, and attributes it to a blow in this region received four years previous to the time at which he first noticed the growth, the injury having been caused by his jumping off a swing and falling into a bush. There is, however, no scar now visible from this accident. During the last two years the lump has been growing more rapidly and to it he attributes his occasional severe headaches and a growing disability to pursue his business, owing to the dizziness which comes on when he stoops forward on the roof at his work. At such times the edges of the tin sheets appear to shake to and fro. The patient is otherwise in good health and has never suffered from syphilis or any other grave constitutional disease.

The tumor pushes forward the internal palpebral ligament, and is hardest and most prominent just above it. The growth

can be traced with the finger a considerable distance back into the orbit. There is good sight in each eye, but both the vision and the range of accommodation are slightly less in the right than in the left eye. In the right eye V = 5/7½, and with it the patient reads 0.50 type from 14-41 cm., while on the left eye V = 5/5, with it he reads 0.50 type from 14–51 cm. The ophthalmoscope shows that the media are clear, that the optic nerves are deficient in capillarity and too gray for his age, but that there is no special difference discernible between the nerve of the right eye and that of the left. The field of vision for each eye was decidedly contracted both for form and color, measuring only about 80° horizontally and about 90° in a direction extending from a point 30° from the vertical meridian in the upper nasal field to a point 30° from the vertical meridian in the lower temporal field.

When the eyes are in the primary position and vertical diplopia is produced by a prism, there are homonymous double images brought into line by a prism of 1° base outward. The pressure of the tumor on the inner and posterior part of the right eyeball prevents the externus from doing its full duty, and limits the motions of the eye outwards and upwards. Consequently when a candle is carried into the upper outer quadrant of the patient's right field, an undue convergence of the eye's axis becomes manifest and there are homonymous double images. The double vision does not exist in other parts of the field, although, as previously mentioned, the want of equilibrium may be detected when vertical diplopia is produced by prisms. There was constant epiphora, and a probe can readily be passed through the canaliculus and into the entrance of the sac as far as the tumor but could not be introduced any further into the lachrymal passage.

Removal of the tumor was advised and with the assistance of my friend, Dr. Geo. C. Harlan, was executed in the following manner. A curved incision was made, starting in the fold of the upper eyelid a short distance below the eyebrow, and was carried inwards and downwards between the tumor and the nose and thence downwards and outwards in the fold at the lower margin of the orbit. The skin and the orbicularis were dis-

I.

Position of the tumor.
(Ivory exostosis.)

II.

Cicatrix one year after operation.

III.

Front view of tumor, natural size.

IV.

View showing position where it was broken from the Os Planum and Lachrymal bone (natural size).

sected loose and turned outward, thus laying bare the tumor. The periosteum was incised over the tumor and was dissected and scraped off from it. Then by the use of a gouge and mallet the healthy bone at the margin of the tumor was broken through, and when the tumor was thus entirely freed from its attachments it sank for some distance into the nasal cavity. An elevator was then introduced under its anterior edge and it was pried up, seized with bone forceps, and removed. All loose spiculæ of bone were searched for and taken away, but some which still appeared firmly attached to the periosteum were left behind. Several of these necrosed and loosened during the healing process and were removed from the wound. The patient made a good recovery and left the hospital in three weeks after the operation. The tumor which I here exhibit proved to be a large ivory exostosis, growing from the orbital plate of the ethmoid bone, and involving it almost in its entire extent, as well as invading the lachrymal bone. The tumor weighed 258 grains. It was nodulated and irregular in shape and measured 41 mm. in its long diameter by 25 mm. in transverse diameter. Its base was constricted and measured 24 mm. by 20 mm. A section was made of it and it was found to consist of dense eburnated tissue throughout, no Haversian canals or cancellated tissue being any where demonstrable in the tumor mass. On close inspection of the cut surface a faint more or less concentric lamination is discernible. The nasal surface of the os planum was, however, rough and cancellated. One of the accompanying photographs of the patient was taken before the operation and shows very distinctly the situation of the tumor, while the other exhibits the scar as it appeared one year after the operation. The smaller photographs give a front and back view of the tumor of its natural size. The patient writes me, 14 months after the operation, that he has lost all dizziness and double vision, and that he is able to work as well as ever, but that the epiphora which troubled him before the operation still persists.

SUPPLEMENTARY REPORT OF A CASE OF IVORY EXOSTOSIS OF THE ORBIT.

BY DR. ROBERT SATTLER,

CINCINNATI, O.

The subsequent developments of a case of ivory exostosis of the orbit which began in the right frontal sinus, reported to the society at the last meeting, prompt this brief supplementary report.

The surgery first resorted to, accomplished without accident the removal of a large bony growth. The deformity and proptosis, which were both pronounced, were completely relieved. There was no complaint whatever, and the patient several weeks after the operation resumed his work.

On a visit eight months afterward a narrow area of necrosed bone was discovered at the upper orbital margin near the fistulous opening, communicating freely with the sinus frontalis which had been kept open by daily antiseptic irrigation and packing.

More careful exploration led me to infer that the sequestrum was a large one.

The discharge had increased in quantity during the last few weeks and the patient referred to an unpleasant odor which he had noticed but recently. Another operation was at once proposed and led to the discovery that the sinus which was found greatly dilated at the first operation and which we had supposed had been completely cleared out, contained another growth. This had been wedged into the external or temporal angle of the sinus and there had caused not alone great distension of this normally constricted portion, but it had pushed the orbital plate of the frontal upwards and had hollowed out a large cavity for itself above and behind, completely concealed by the overhanging orbital margin. This explained why neither exopthalmus or displacement of the globe had resulted.

RECURRENT EXOSTOSIS OF ORBIT.
(SATTLER.)

A large incision enabled me to thoroughly expose this region for inspection. A few chips of bone exposed the hard growth within the sinus. I then determined to remove it within its enveloping walls. To accomplish this the incision into the bone had to be made so far up in the frontal region — fully one and one-half inches above the free margin — that the thought of a possible intracranial attachment or a rarefaction or absorption of the orbital plate of the frontal bone was again suggested.

The entire orbital margin containing the growth was removed, together with a large area of sclerosed bone surrounding it. The orbital plate of the frontal had yielded to the pressure of the growth so that a concavity fully as large as a pigeon's egg had resulted. Above, it was so thin that the brain pulsation could be distinctly observed.

The great displacement affected by the bony growth was behind and above the upper orbital margin, partly external, but a much larger part concealed or within the orbital cavity, and on this account did not produce exophthalmus or other disturbances.

The surprising feature was that there were no brain symptoms, no pain or other complaint.

The subsequent progress of the case was favorable.

DISCUSSION.

DR. E. JACKSON.— With reference to the matter of ivory exostosis I would like to say that the case I reported five years ago has remained that length of time without any return of any sign of the disease. In that case the growth sprang from the upper part of the ethmoidal sinus and possibly partially from the frontal sinus. It did not extend into the sinuses but seemed to be entirely in the orbit.

INTRA-OCULAR ENCHONDROMA, SPRINGING FROM THE CHOROID.

By EDWARD JACKSON, A.M., M.D.,

PHILADELPHIA, PENN.

Mrs. G., aged 57, came to me at Denver, January, 1896. Nine months before that the lids of the left eye had become swollen, and she discovered that she could not see with it. At first she was still able to recognize movements of the hand in the temporal portion of the field of vision, but in a few weeks all perception of light was lost. She had commenced wearing glasses for near work nine years before, and her eyes had always been well and strong, so far as she knew, until the preceding April. She had suffered no acute diseases of any kind; was subject at times to a hard cough (bronchitis), but had nothing of the kind at the time her eye became affected. Up to last April she had no difficulty in threading a needle, but great difficulty since that time, although her glasses are suited to the good eye, which has normal vision. She cannot close either eye without closing both of them. (Winking test.) The swelling of the lids subsided in two or three weeks, but they have again been swollen, with pain and inflammation of the eye for the last two months. She was seen last April and subsequently by Dr. C. J. Scott, who found the retina generally detached, with retinal hemorrhages, increased tension of the eyeball, and vision gone. The tension has been rather high ever since.

Present Condition. The lids are thickened, palpebral fissure narrowed, and lid margins red. The palpebral conjunctiva is thickened, and there is conjunctival and sub-conjunctival thickening on the eyeball, with slight pericorneal redness. The cornea shows a few specks of opacity near its lower margin. These are superficial. Otherwise the cornea is clear. Tension of the globe + T. 1. This did not vary materially during the four days the eye was under observation before removal. The iris is slightly muddy and thickened. The pupil is entirely

fixed, and the lower margin adherent to the lens capsule, with loops of vessels passing from it on to the anterior capsule of the lens, and extending to almost the center of the pupil. The lens is slightly hazy, showing the lens sectors. The iris does not bulge at any point. The anterior chamber is of good depth, considering the patient's age. The vitreous is very hazy, with floating shreds of opacity, and more fluid than normal.

The above is all that could be made out by the ordinary ophthalmoscopic illumination; but, on examination with the ophthalmoscope, using direct sunlight reflected by a 9-inch mirror, held two or three inches in front of the eye, with a strong convex lens back of the mirror, it is clearly seen that the retina is detached, and through it can be made out the outline of a large, new growth situated below and to the nasal side. Under good illumination, there were noticed a few pearl-like masses 1 mm., or a little more, in diameter in the subjunctival and scleral tissue, which looked like inflammatory lymph masses.

The eye had now been painful, and had troubled her greatly for some months, with constant increased intraocular tension. The diagnosis given was tumor (probably sarcoma) of the choroid, and enucleation was advised.

January 31st enucleation was performed at St. Luke's Hospital, Denver, with the removal of about 8 mm. of the optic nerve. No evidence of perforation of the sclera or involvement of the nerve by the growth was discovered. There was considerable bleeding, which was checked by pressure, and caused extensive ecchymosis in the lids, which extended so that there was also ecchymosis in the right upper lid, and on the left side of the discoloration extended down to the angle of the jaw. The socket healed normally, and has been well ever since. The patient's health continues good.

On opening the eyeball, hardened in formalin, the tumor was found, involving the inner posterior one-third of the globe, extending from the *ora serrata* on the inner side to about 6 mm. beyond the macula, and vertically, from slightly to the inner side of the upper end of the vertical diameter of the

globe, to about 5 mm. to the temporal side of the same diameter below. At its anterior margin it was abruptly limited by the *ora serrata.* Posteriorly, and outward, it was bounded by a gradual transition into normal fundus. The mass of the tumor was entirely free from vessels, quite translucent, and gray in color, with but a little more tinge of yellow or brown than is now shown in the part of the specimen exhibited. Posteriorly, it was more opaque, and contained some vessels.

On section, it is found to consist of a hyaline, slightly-granular, cartilaginous mass, containing small cavities, with rounded masses that look like nests of cells in hyaline cartilage, but which contain no nuclear elements. The whole mass stains very imperfectly with either carmine or logwood. The mass lies back of the degenerated retina, and in front of the choroid, and seems to be connected with the latter.

The following report of the microscopical examination is made by Dr. Florence Mayo of Philadelphia, who prepared the sections shown under the microscope. It agrees substantially with the observations of Dr. E. R. Axtell of Denver, who also examined a portion of the growth:

"The specimen was the lower half of the eyeball, which had been hardened in formalin solution.

"Microscopically. Globe of normal size. Cornea, iris, and lens normal in appearance. Optic nerve of normal size. About 1 mm. to the left of the entrance of the optic nerve, and just below its level, appears a growth which has a broad (3 mm.) but thin attachment to the posterior wall of the globe. This growth, triangular in shape, extends forward and down into the vitreous, causing complete detachment of the retina on that side. The growth has no connection with the inferior wall of the globe, but is broadest at that point (7 mm.).

"Horizontal sections of the globe were made. When the knife reached the growth it buckled, and as it passed through the growth the same sensation was produced as when imperfectly decalcified bone is cut. Thin, perfect sections of the growth were hard to make, owing to its great brittleness.

"Microscopically. The sclera is normal. The papilla is swollen, and is infiltrated with small round cells. Extending

from the choroid at the left of the nerve head is a broad band of fibrous tissue, loosely arranged with large interstices containing red blood corpuscles, near the choroid. But, gradually becoming more compact, and finally losing its fibrous structure, it appears finely granular, almost hyaline. Embedded in this granular matrix are numerous cells of varying sizes arranged in rows, also in clusters. The nuclei of these cells are not visible. There are no blood vessels. The growth is evidently cartilage, whose matrix has become somewhat calcified, without forming bone."

The following features of the case seem worthy of special attention: The history of the rapid onset of difficulty in seeing, suggestive of loss of binocular vision, and the complete inability to close the blind eye without closing the other, point toward the recent loss of useful sight in the affected eye. This would probably indicate merely the recent extension of the growth into the region of the macula.

The clear history of the whole group of symptoms, belonging to the second or irritative stage of an intraocular new growth, was striking, and when seen these symptoms were well marked. This seems opposed to the idea of any merely degenerative change in normal structures.

Third, the case illustrates the value of ophthalmoscopic examinations by direct sunlight — a method I have resorted to in other cases of blind, or almost blind, eyes, without injury to the eye, and with decided gain in added knowledge of the case.

In so far as I have been able to examine the literature of intraocular tumors, no similar case has been recorded. A case of ossification of the choroid, resembling it in some respects, is reported by Laquer in the *Archives of Ophthalmology* for 1877–78, Vol. VI, page 284. The patient was a man aged 36, who presented himself with a small, shrunken cataract, that had recently become dislocated into the anterior chamber, and was causing trouble. The lens was extracted, and immediately the cornea collapsed and became wrinkled, and it resumed its normal shape quite slowly. The extraction wound, however, healed well and promptly. But there was no sight, and the ophthalmoscopic examination revealed nothing resembling the

optic disk, the retina, or the retinal or choroidal vessels. The fundus appeared as a light concave surface, with points of cholesterine reflex. Palpation now showed the entire posterior segment of the eyeball to be as firm and resisting as bone, although the anterior segment presented tension below the normal. The border of the deposit was sharply felt above, just back of the ciliary region. The sight had been lost sixteen years before, without any assignable cause, and there had been no considerable inflammation of the eye until the lens became dislocated into the anterior chamber.

It will not be forgotten, in this connection, that enchondroma is sometimes closely associated with sarcoma and cancer.

ANGIO-SARCOMA OF APPARENT RETINAL ORIGIN.

BY WALTER B. JOHNSON, M.D.,

PATERSON, N. J.

The case of intraocular sarcoma here reported is of special interest in consequence of the extended period of time which intervened from its supposed inception, when vision was first affected, until the inflammatory period, which only occurred about three months previous to the time when enucleation was performed, although the severe pain which finally necessitated immediate operation had only been present for two weeks, and was probably caused by the increased tension due to the very considerable intraocular hemorrhage, which an examination of the macroscopical preparation shows occupying more than half of the intraocular field. The macroscopical and microscopical study of the specimen and also the accompanying drawings were made by Joseph Byrne, M.D., house surgeon at St. Joseph's Hospital, Paterson, N. J. The history of the case is as follows:

B. H., a female, aged 23 years, married, a native of Ireland, on September 2, 1896, applied at the Paterson Eye and Ear In-

firmary for treatment, stating that her father was about 45 years of age, perfectly well, and working every day ; her mother was also in good health ; her maternal grandmother died as a result of cancer of the breast ; the remainder of her family had all been healthy and robust, and lived to a ripe old age. She has no knowledge of any member of her family, either on the paternal or maternal side, having had syphilitic, cancerous, scrofulous, or tubercular disease except as above stated.

The patient has been informed that she had some trouble with her eyes when a baby, but is unable to ascertain what the exact character of the difficulty was. The eyes at that time were considerably inflamed, and her vision was somewhat impaired, and, although the eyes subsequently appeared perfectly normal, she thinks that some disturbance of the normal acuteness of vision was present from that time.

When between ten and eleven years of age, that is, about twelve years ago, the sight of the right eye gradually became affected, and in the course of a few weeks it suddenly entirely disappeared, and, after that time, she was unable to distinguish light from darkness. The right eyeball was also more prominent than the left. The eye remained sightless, but caused her no discomfort until about three months ago, shortly after the birth of her only child, when an inflammation developed attended by pain, redness, and increased prominence of the eyeball. The pain continued for two weeks, after which time the eyeball became more comfortable, although it remained more prominent than it had been previous to the attack.

Two weeks before the time of the present visit, her eye became suddenly severely inflamed and grew more painful, steadily increasing in prominence, lancinating pains developing, extending upward, and hemicranial, resembling the pain in acute glaucoma, and downward along the side of the nose, causing constant lachrymation, finally, during the past three days, be coming so excruciating that she has been unable to sleep or eat, and is anxious to do anything which will result in relief from her suffering.

The patient is fairly well nourished, although she has not thoroughly regained her strength since the birth of her child.

On examination there is noted considerable œdematous swelling of the eyelid, and exophthalmos, the right eye being advanced at least one-quarter of an inch in front of the plane of the fellow eye. The area of the cornea is increased, its diameter being about one-eighth of an inch greater than the left cornea. The iris is pigmented and swollen, adherent to the anterior capsule of the lens, the pupil dilated and not responsive to light, there is decided episcleral engorgement and staphylomatous elongation of the eyeball, with marked thinning of the sclera, especially noticeable on the superior surface of the globe in the ciliary region, the pigment of the ciliary body shining through. On oblique illumination, the vitreous cavity appears to be nearly filled with a bright yellowish body, seemingly attached on the temporal side of the globe. In the bright sunlight reddish spots and lines can be traced in the stroma of the new tissue, which seem to indicate very considerable vascularity. The density of the growth prevents satisfactory illumination by either direct or indirect ophthalmoscopic examination, and no definite ophthalmoscopic picture could be obtained.

R. V. = Loss of light perception.

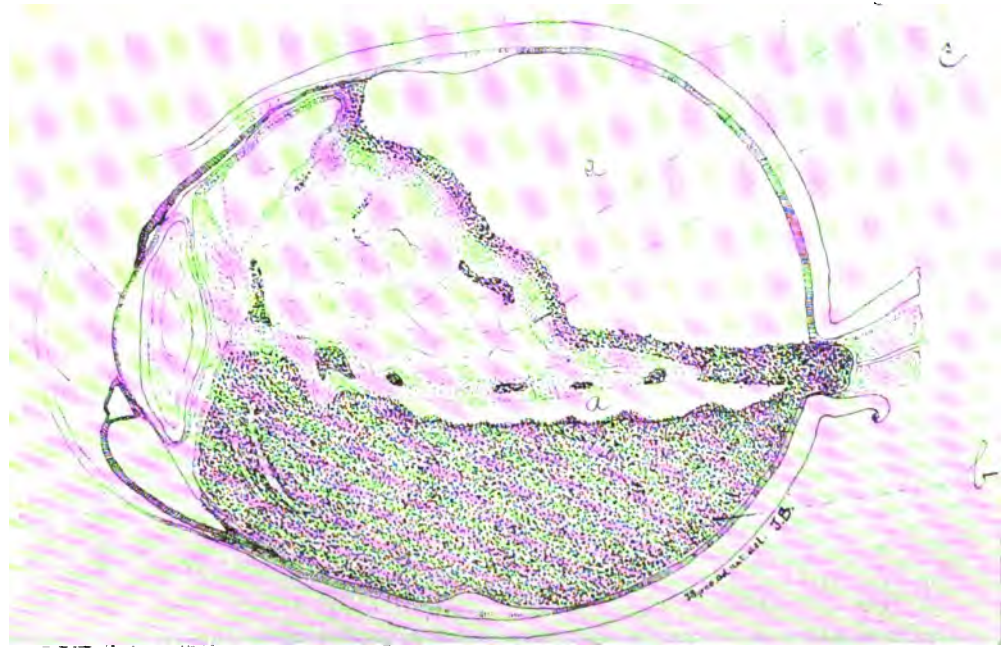
L. V. = 20/15.

The diagnosis was sarcoma of the ciliary body, and enucleation was advised.

September 4th. The eyeball was enucleated in the usual manner. It presented no indication of further disease either on its posterior surface or in the vicinity of the optic nerve entrance. The specimen was placed in a ten per cent. solution of formaldyhide, and sent to Joseph Byrne, M.D., for further examination, the result of which is as follows:

MACROSCOPICAL EXAMINATION.

A right eyeball. *Before section* it manifested to the touch a sensation of resistance in its nasal half. The cornea was very prominent, the pupil moderately dilated, the iris adherent to lens capsule and bulged forward so that it touched the cornea for some distance. This was more particularly noticeable in the inferior nasal quadrant. In the superior nasal quadrant the sclerotic was so weakened from intraocular pressure that the



Horizontal section through eyeball. *a a a*, vitreous; *b b*, extravasated blood; *c*, retina enclosing grayish tumor-mass; *d*, cornea; *e*, hardened aqueous; *f*, portion of detached capsule.

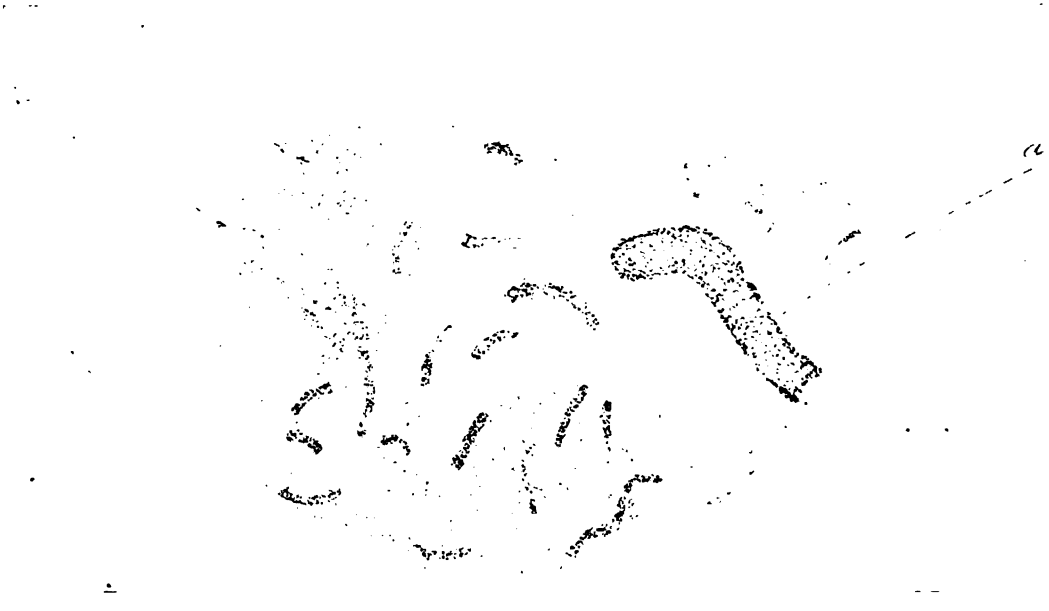


FIG. 1.

Low power Showing general structure *a*, large bloodvessel with very thin walls surrounded by an area of degeneration; *b*, curious brush-like bodies; *c*, small bloodvessels.

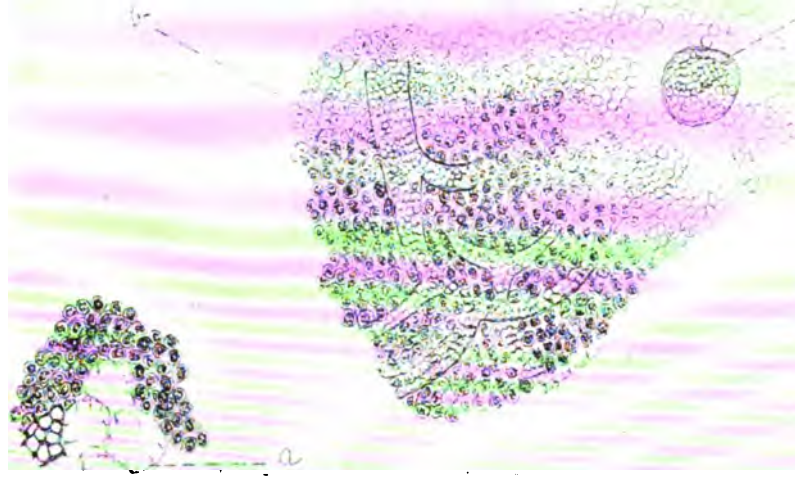


FIG. 3. FIG. 2.

Fig. 2. High power. *a*, shows large bloodvessel with thin walls surrounded by an area of degeneration; *b*, shows smaller bloodvessels.

Fig. 3. Shows at *a*, the remains of alveoli with broken off trabeculæ; at *b*, are seen a few cell-spaces from which the cells have been removed.

FIG. 4.

High power. Showing brush-like bodies. *a*, shows a degenerated bloodvessel as it merges into a brush-like body. Degenerated blood-cells can be seen in its lumen; *b*, shows the striated appearance of the degenerated area occupying the center of the tumor whence the brush-like bodies radiate towards the periphery.

choroid could be plainly seen shining through it. To the unaided eye it looked as if there had been a rupture which had exposed the choroid.

The eye, which had been hardened in formalin, was divided by a horizontal section which passed through the optic nerve entrance and the center of the area of resistance above mentioned. Measurement showed a considerable increase in the antero-posterior diameter of the eye. Other measurements were normal. One-half of the eye was set aside for microscopical sections; the other half, in which the natural color of the various structures was beautifully preserved by the formalin, was mounted in gelatin, and from it the following description and the accompanying sectional drawings were taken.

The central portion of the vitreous chamber is occupied by the completely detached retina which, in the shape of the letter V, embraces a grayish-white mass. This mass constitutes the main bulk of a sarcomatous tumor as shown by microscopical examination. The inner portion of the vitreous chamber is filled with blood, the result of a recent hemorrhage. This blood occupies almost one-half of the vitreous chamber, and was the cause of the resistance experienced on palpation. The outer portion of the vitreous chamber is occupied by the vitreous body. The outer arm of the retinal V is skirted by a dark margin, which at first was thought to be the choroid, but was subsequently proven to be blood. A narrow, clear space, occupied by vitreous, separates the inner arm of the V from the large collection of extravasated blood. The retina can be traced to the ora serrata, and here may be seen, on the nasal side, the pars ciliaris, which has been dragged forward and lies in contact with the posterior layer of the suspensory ligament. In the outer portion of the eye the pars ciliaris has not been drawn so far forward, but, partially folding on itself, encloses a clear space which is filled with vitreous. Just behind the outer half of the lens a small, hazy area, with faint linear markings, is seen intervening between the lens and the retinal mass.

The retina, with its enclosed mass, shows numerous small, dark spots, resembling extravasated blood. The central mass is grayish-white in color. In some parts it seems to be striated,

and in other it presents a light-colored, irregular appearance, dotted here and there with small areas of greater density. The tumor-mass seems to be more intimately connected with the outer arm of the retinal V. The optic disc shows a well-marked cupping, which is filled with extravasated blood.

Anterior to the lens may be seen a crescentic space formed by a detachment of the unbroken capsule. Between this detached capsule and the inner surface of the cornea is seen the hardened aqueous in which is imbedded the iris. This latter, at the pupillary margin on the nasal side, shows a cystic cavity which contains substance resembling hardened aqueous, and here the iris seems to be adherent to the capsule of the lens.

The external coat shows a thinning at the sclero-corneal junction. This thinning is very marked on the nasal aspect, and involves the sclera for some little distance backward. There is but a faint trace of a ciliary body. The retina and optic nerve have already been described.

MICROSCOPICAL EXAMINATION.

Beyond what was noted in the macroscopical examination there was nothing abnormal to be found in the sclera. The atrophy of the choroid was remarkable. Some of its layers had disappeared. On the nasal side the ciliary body was represented by a little connective tissue in which were to be found a few straggling muscle cells.

The optic nerve showed considerable increase of connective tissue, traversed here and there by structureless hyalin strands, the remains of the nerve substance proper. The region of the cupped disc was infiltrated with leucocytes.

The retina, or what remained of it, was seen surrounding the central tumor-mass. The layer of rods and cones was missing. The membrana limitans externa was well preserved in places. (Fig. 5, *a.*) The external nuclear layer was, for the most part, thickened, the thickening being due to an increase in its cellular elements. The internal nuclear layer can be recognized at places. The remaining layers cannot be distinctly made out, the retina merging into the tissue of the central

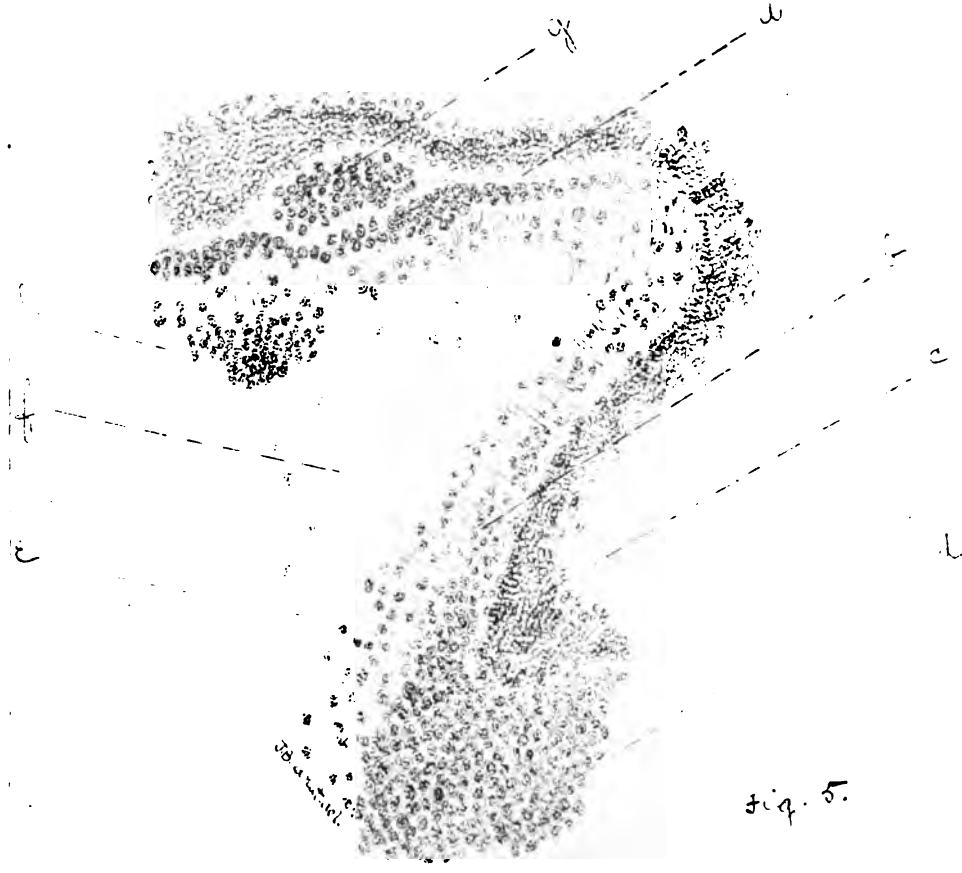


FIG. 5.

Showing *a*, membrana limitans externa with external nuclear layer internal to it; *b*, external nuclear layer as it merges into tumor mass *d*; *c*, extravasated blood; *e*, hyaloid membrane and the remains of innermost layers of retina; *f*, vitreous, *g*, and *h*, masses of cellular tissue resembling in structure the central tumor-mass.

tumor. One part of a section (see Fig. 5) shows the retinal remains where they bend inward toward the tumor and topple over, the cells of the external nuclear layer becoming directly continuous with the tumor-mass. The same section shows two small aggregations of cells placed near each other in the retina before it fuses with the tumor-mass. One of these masses (Fig. 5, *g*) is just external to the external nuclear layer; the other is on the inner aspect of the retina. Both consist of small round cells in intimate relation with an extremely delicate stroma, forming a tissue essentially identical with that composing the main tumor. Skirting the outer layer of the retina on the external aspect of the eye is a narrow rim composed of red blood-cells. On the nasal side of the retina is a large collection of blood separated from the retina by a narrow strip of vitreous.

The tumor itself presents to the low power an extremely cellular structure traversed irregularly by an enormous number of blood-vessels, which, in the main, are large and have extremely thin walls. In fact, with the low power no walls can be seen at all in most cases. Many areas of degeneration are seen, especially in the neighborhood of the larger vessels, and in the center of the mass. These areas present a marked contrast to other well-preserved areas. Peculiar brush-like bodies resembling a fox-tail are seen projecting from the central area of degeneration into the better preserved peripheral portion of the tumor. (Fig. 1, *b*, *b*.) These bodies consist of a central shaft or stem from which spring numerous slender processes which, on longitudinal section, present a rather regular bi-penniform arrangement. In the immediate vicinity of the peripheral extremities of these bodies is seen a cellular area which stains rather more deeply than the neighboring structure. The shafts and processes of these bodies are of a homogenous, hyalin appearance.

The higher power (Fig. 2) shows the tumor to be composed of small round cells about the size of a large leucocyte, and having a rather large, granular nucleus. The stroma is scanty and seen with difficulty. In one portion of the tumor, however, an area is seen from which the cells have been removed, and here we see larger alveoli with short processes, apparently represent-

ing the ends of broken trabeculæ, which subdivided each alveolus, making smaller cellular spaces capable of accommodating one cell. (Fig. 3.) The different areas of degeneration are seen to be of the same cellular structure as the rest of the tumor. The processes of the fox-tail bodies seem to be continuous with the stroma of the tumor. (Fig. 4.) These bodies are apparently the result of a degeneration of blood-vessels and of pressure.

The central shaft is apparently the remains of a blood-vessel, and in one instance (Fig. 4, *a.*) I have been able to trace a more or less degenerate blood-vessel, which can be identified by the blood-cells which it contains, as it becomes transformed into a brush-like body. The processes of these bodies seem to be produced from the stroma of the tissue which has been pulled taut and from which the cells have disappeared. In the center of the tumor the structure shows an area of degeneration of hyalin appearance and lacking in cells. It is composed of a fine mesh of fibers, having a more or less regular appearance, and which again seems to be stroma subjected to pressure. It is continuous with the processes of the fox-tail bodies near the center of the tumor. (Fig. 4, *b.*)

In accordance with the foregoing the anatomical diagnosis is: Angio-sarcoma seemingly of retinal origin.

DISCUSSION.

DR. JACKSON. — The remark of Dr. Johnson that in his specimen the gelatin had softened, reminded me that my specimen is mounted in formalin solution. It is a very satisfactory method. I mounted that specimen yesterday afternoon within five minutes. It is available to take out and cut sections at any time if you wish. I have microscopic sections of my growth in the other room, if anyone wishes to look at them.

DR. J. E. WEEKS, New York. — I wish to speak of the case of Dr. Johnson. I think that his description of the growth is enough to classify it with the gliomata. It is very true that glioma is classed by some with the sarcomata, but the cells that he has depicted are certainly those peculiar to that form of neoplasm. If we retain the term glioma, Dr. Johnson's tumor should come under that head.

DR. LUCIEN HOWE, Buffalo.— I would say a word in regard to the small intra-ocular growths and readiness with which I was surprised to find, in one instance at least, they can be removed. I would also mention an article that attracted my attention some time ago in the *Anales d' Oculistique* in regard to the removal of such a growth about the size of a pea. I regarded it with skepticism at the time. Having such a case the question arose whether it was possible, and I made a large conjunctival flap and laying that back removed the growth, which was projecting into the anterior chamber and pushing up the lens. The wound healed and I was surprised at the excellence of the result.

REMOVAL OF A PIECE OF IRON IMBEDDED IN THE CRYSTALLINE LENS.

DR. WM. THOMSON,

PHILADELPHIA, PENN.

On Feb. 16, 1897, before the section on ophthalmology of the College of Physicians, this case was presented, and the following discussion took place:

Dr. A. G. Thomson exhibited, by invitation, a *Case of Foreign Body in the Lens.* A weaver of 25 applied at the Wills Hospital, service of Dr. Wm. Thomson, in January, 1897, complaining of asthenopia only. The R. eye had been convergent and amblyopic since childhood. With a cylindrical correction vision of L.— the wounded eye — was $\frac{5}{3}$, and by its use his symptoms disappeared. Tenotomy of the interni cured the squint. In February he returned, complaining of diminished vision in the L. By oblique illumination a dark foreign body was easily seen in the posterior half of the lens. It was then learned that in December, while using a hatchet on the top of a wooden box, the patient had the sensation of a foreign body impinging on the cornea, and concluded he had been struck by a piece of wood. This he thought had been removed by his physician. Vision had decreased to $\frac{5}{30}$. A small linear scar on the lower outer sector of the cornea, a similar scar on the lens capsule, and the quiescent foreign body lying in the lens substance could be seen. The lens fibers had commenced to

become opaque, although in the track of the foreign body they were still clear.

The features of especial interest in this case are the freedom from all irritation and the preservation of vision for two months after the entrance of the foreign body, and the treatment to be adopted, namely, whether the foreign substance shall be extracted by the magnet if it is a piece of metal, or whether, should it be metal or wood, the lens in its capsule should be extracted.

DISCUSSION.

DR. EDWARD JACKSON had searched before the lens became as opaque as it now is, to find the path of the foreign body through the lens, and had been unable to see the slightest trace of it. Opacification had developed first immediately adjacent to the anterior and posterior capsule, and even now had not penetrated into the nuclear region. He had seen cases in which opacity had formed soon after the entrance of a foreign body, and then had disappeared to re-appear three or four months later. In a case of dislocated lens in spite of repeated needling the disturbed portion of the lens cleared and continued free from opacity.

DR. HARLAN considered the best treatment in the case of this patient to be the extraction of the foreign body by means of the magnet while the lens was clear, and the extraction of the lens later. A case of his own had justified these measures.

DR. B. A. RANDALL suggested that the so-called foreign body might be a deposit of pigment. He had seen a number of children that showed similar opacities that closely resembled foreign bodies even to the metallic shine, but in which no history of traumatism could be obtained. The deposits were in the posterior part of the lens and occasioned no trouble.

DR. WM. THOMSON proposed to submit the patient to the X-rays, in order to determine whether the foreign body is a piece of metal or a piece of wood. If the former, a powerful magnet could be employed to draw it forward so that it could be more readily extracted. In its present position, extraction would be extremely difficult. He suggested, first, discission and removal of the anterior portion of the lens, then the introduction of the magnet, or Pagenstecher's operation for the removal of the lens in its capsule, or, better still, the extraction of the lens with the foreign body by the usual method for senile cataract.

DR. RISLEY thought that if the body is metallic the X-ray would be desirable. He considers the Haab magnet dangerous on account of the liability of the body to fall into the posterior chamber, as had twice happened to him. The safest procedure would be the Pagenstecher operation after a large preliminary iridectomy.

DR. DE SCHWEINITZ suggested the use of the Haab magnet or the method advocated by Dr. Harlan. In reference to the amblyopia we must remember that "neglected" eyes can be divided into two classes: those that have defects in the field for form and color, especially scotomas with changes in the nerve and retina, and those that are amblyopic without anatomical changes. In the former no improvement of vision can be expected, while the vision of the latter may be improved by enforced use.

I was here confronted with an amblyopic eye, which, when corrected $+ 3^s \supset + 75^c$ ax 90 had $V = \frac{5}{30} = \frac{1}{6}$, and a left eye becoming blind from traumatic cataract, with foreign body. On March 18th, the lens was too opaque to enable the foreign body to be seen. It had been located a trifle below the center, and to the inner side, and near the posterior surface. I decided to attempt its removal by extraction of the lens. The incision with a flap of 4 mm. was made in the upper part of the cornea, followed by a large iridectomy. The anterior capsule was divided horizontally near its upper border, and a second cut was made from below, upwards. I was anxious to avoid any pressure upon the cortical portion in its delivery, and I passed the cystitome a second time to the lower part of the lens, pressed it into its surface, and had the satisfaction of lifting the lens with but little loss of its softened cortical out of the cut, having the foreign body still embedded in its interior. There was no further trouble, and on April 6th, the man was discharged, having been corrected to $V = \frac{1}{2}$ with $+ 10^s$.

His amblyopic eye had increased in V from $\frac{5}{30}$ to $\frac{5}{20}$.

I might add after this fortunate result, that on April 15th he came to my office, having a short time before, in stooping to pick up some of his clothes, struck this eye with great force against the round top of a chair-post. His V was almost *nil*. he could see fingers moving at one foot to one side, the wound

had re-opened, vitreous was escaping, and there was blood in the anterior chamber. The eye was treated with antiseptics, occluded, and bandaged. No bad symptoms followed, and I had the pleasure of discharging him on April 29th, with V $\frac{5}{15}$ with the chance of further improvement. The foreign body was about a mm. in length, irregular in shape, and pointed like an arrow head.

The negative made by the X-ray by Dr. Wm. M. Sweet gives this case its main interest, since it proved beyond a doubt the existence of the foreign body when it could no longer be seen by any method of illumination.

THE VALUE OF REPEATED AND DIFFERENTLY PLACED EXPOSURES TO THE ROENTGEN RAY IN DETERMINING THE LOCATION OF FOREIGN BODIES IN AND ABOUT THE EYEBALL.

BY CHARLES A. OLIVER, A.M., M.D.

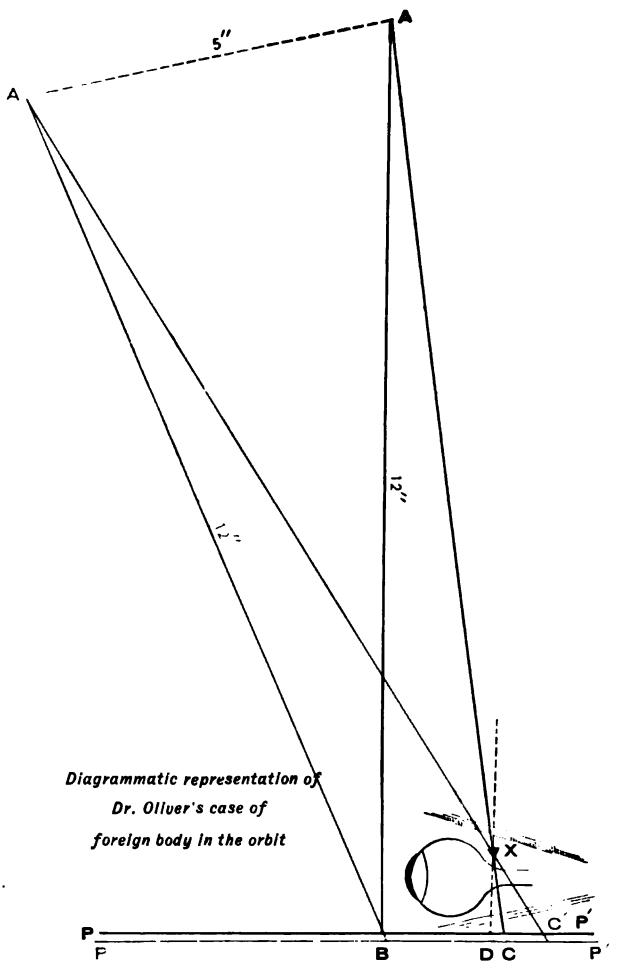
PHILADELPHIA, PENN.

The conclusions arrived at in this brief communication are based upon the results with the Roentgen ray obtained from a series of observations made in three cases that have been recently seen in the writer's practice.

Without giving the details of the clinical histories and merely mentioning that in each instance, the accident was recent and in a previously healthy eye, it will be sufficient to state that it was found by the method adopted, that two of the cases showed the presence of foreign bodies in the orbit outside of the eyeball, while the third distinctly proved that the object sought for was situated in the interior of the organ.

The method devised by my friend, Dr. Charles L. Leonard, Associate in the William Pepper laboratory of clinical medicine, to whom full credit should be given, consisted, as opposed to the plan brought forward by Exner,* in the fact that the base line for triangulation is made anterior to the cranial shadow, and the exposures are repeated sufficiently often at

* Vide Deutsche medicinische Wochenschrift, 7th Jan., 1897.



Diagrammatic representation of Dr. Oliver's case of foreign body in the orbit

fixed distances and set situations so as to give a multiple series of relational sides and angles from which the exact position of the foreign body can be accurately determined. No fixed apparatus is employed.

The accompanying scheme, which was used to determine the location of a piece of steel in one of the cases, will serve to illustrate the methods pursued.

Here it will be seen that the foreign body is supposed to be situated at the point X. The question put is, How shall it be located?

The first sensitive plate (shown in black) is placed in the position PP′ on the side of the patient's head. A point B is taken (if possible anterior to the eyeball) and marked by a lead wire fastened on the surface of the envelope covering the plate. The Crooke's tube is placed upon the opposite side of the skull at a point perpendicular to the plane of the plate at the fixed point B. This in the figure is shown to be in the position A and at a known distance (12″) from the sensitive plate. In consequence, the shadow of the object X is cast on the plate at the point C.

This accomplished, a second plate (red line PP′) is placed in the same position as the first, the point B fixed, and the Crooke's tube placed at a known distance (A′ B = 12″) from the point B, and at a known distance (A A′ = 5″) from the former position of the tube. As a result, the shadow is cast at the point C′ on the plate.

By this method the following points from which the distances B D and D X may be determined, are obtained, and in consequence, the position of the foreign body X is gotten.

The data determined are the distance A B, equaling 12 inches; the distance A′ B equaling 12 inches; the distance A A′ equaling 5 inches; the distance B C equaling 1¼ inches; the distance B C′ equaling 1¾ inches, and the angle A B C equaling a right angle.

The triangle X D C formed by the perpendicular D X which is parallel to the line A B, will be necessary to determine.

In the triangle A B C, two sides and the included angle be-

ing known, the remaining factors must therefore be known. The angle D X C equaling B A C, the angle X C D equaling A C B, and the angle X D C equaling a right angle, it becomes necessary only to determine one side to get all the factors of this triangle.

The isosceles triangle A B A′ having all of its sides known, the angles can therefore be determined: the angle A B A′ is therefore known.

In the triangle A′ B C′, the sides A′ B and B C′ are known, and the angle A′ B C′ equals A B A′ plus a right angle; the factors of A′ B C′ are therefore known. In the triangle C X C′, the angle C C′ X is therefore known, the angle X C C′ = two right angles minus the known angle X C D, and therefore as C C′ = B C′ — B C, all the factors of the triangle C X C′ can be determined; and all the angles of the triangle B X C have been obtained; and as the side X C, common to the two triangles C X C′ and C X D has been determined, the sides X D and D C can be determined, and consequently the distance D X and D B: which was to be proved.

A simpler method which can be readily comprehended by study of the accompanying plate, is to draw a diagram to scale and to measure the distances accurately.

REMOVAL OF PIECE OF STEEL LOCATED BY X-RAYS FROM INTERIOR OF EYEBALL.

DR. WM. THOMSON,

PHILADELPHIA, PENN.

J. A. R., a machinist, age 20, came to Dr. Thomson's clinic at Wills Hospital, on April 20, 1897. He stated that about eight months ago he had been struck on the left eye by a piece of steel about ¼ inch long and ⅛ wide, while using a hammer and chisel; severe inflammation followed, although it was not known that the piece had penetrated the ball. In six weeks time the eye became quiet, but when his sight was tested, it was then about as now, limited to perception of objects moving only in the outer and lower quadrant of the field of vision.

R. has V = ¼ with no sign of disease. The left ball shows a scar 2 mm. from corneal border near the lower edge of the tendon

of the external rectus muscle about 3 mm. in length, vertical in direction.

The eye is normal in appearance, but is at times painful. The cornea and lens are transparent, and the media beyond at the inner half of the ball. Opposite the scar in the left ciliary region, there is a large white mass of cicatricial tissue, and extending backwards from it a band of like tissue to be traced to the posterior part of the fundus to the outer side of the papilla. The ciliary mass can be seen with + 15, and the vessels of the retina evidently detached above and below the band have a refraction of + 6 or more. The vessels on the disc seem advanced on the temporal side, and are seen with + 6. To the inner side of the papilla the details of the retina are well observed with + 2.

It was believed that if a piece of steel from his chisel had passed into the ball, that its track was marked by the band passing from front to back through the vitreous humor. It was nowhere to be seen, and it was believed that it was firmly incysted if it remained in the ball, although it was not certain that it might not have passed through the sclera posteriorly. Here was an instance where the X-rays might perhaps give the evidence needed to clear up all doubt.

Dr. Sweet made a number of negatives showing the position and size of the foreign body, as well as the diagrammatic drawing presented herewith. He ventured to predict that the piece of steel would be found below the horizontal line and to the temporal side of a vertical one of the ball, and 20 mm. from cornea. I had little hope of removing it with a magnet on account of the dense envelope of connective tissue which was so apparent by the ophthalmoscope, but it was decided to attempt its removal first by that means, and failing in it to endeavor to follow the line of the cicatricial band and remove the steel by forceps. It seemed necessary to attack it behind the cicatricial band, and there, an incision below the border of the rectus muscle and behind the equator was made horizontally, the eyeball being strongly turned toward the nose, on April 29, 1897. The cut was followed by the escape of a straw-colored fluid, and the ball became col-

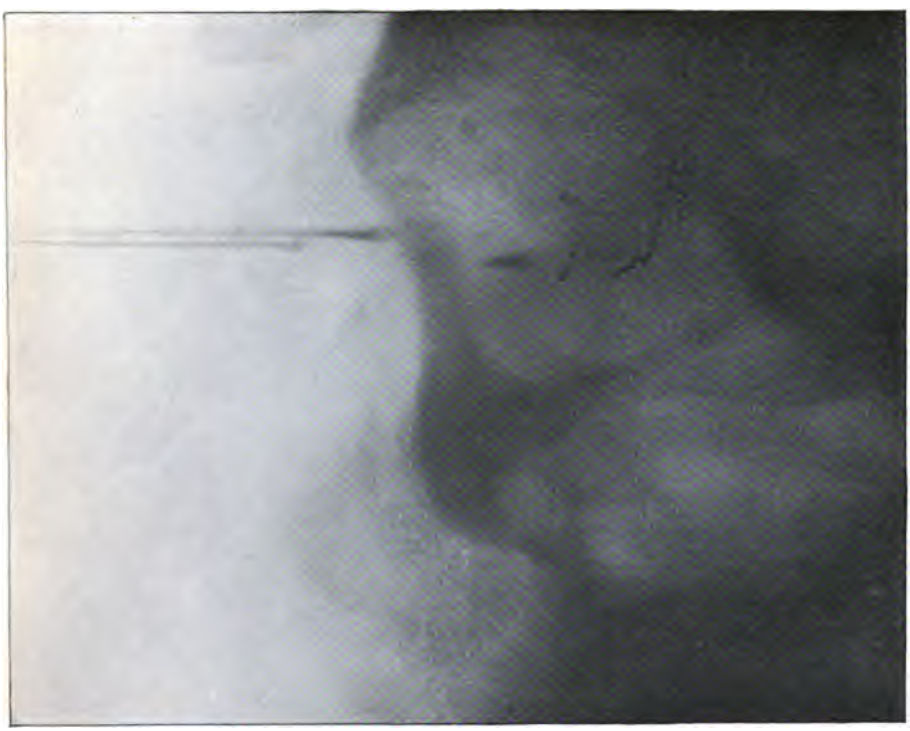
lapsed. The magnet introduced several times brought nothing out, nor could I feel any resistance to it using it as a probe. A small strabismus hook was then passed and the band of cicatrix was caught and drawn into view where it appeared like a string of catgut, two or more mm. thick. It was too firmly attached to be torn either anteriorly or posteriorly; holding it with a forceps it was cut anteriorly, and its posterior attachment followed by cuts of the scissors until it was divided posteriorly and removed from the ball, having the foreign body firmly incapsulated in its posterior extremity. I have every reason to believe that it was accurately located by the X-ray photography. Its length was from 4 to 5 mm. and its width 3 mm. When the powerful electro-magnet was approached to the mass it moved toward it, but made but a weak adhesion to it after its removal.

The operation was made as a possible means of saving the ball for cosmetic reasons, but with the idea that enucleation might soon be demanded. On June 4 the eye presented almost a normal appearance, the cornea clear and bright with no further defect than a faint reflex from the pupil.

The radiographs by Dr. Sweet give a vivid interest to this case. In determining the position of the foreign body in the eye an apparatus was employed, consisting of an ordinary head band supporting two aluminum rods, each with a steel ball at one extremity. One indicator is in the line of vision, at a known distance from the center of the cornea, in this case 4 mm. The other indicator is parallel to the first, and 12 mm. to the temporal side, although any distance may be taken. The photographic plate is to the side of the head, parallel to the indicators. Two exposures are made, one with the two indicators in line horizontally, and the other with the X-ray tube about 30 degrees below the horizontal plane of the indicators. A Queen automatic regulating tube was used, a high vacuum being secured to give great penetrating power through the bones. The exposure was four minutes in each instance.

From the first negative, with the tube and two indicators in the same plane, the distance of the foreign body below the horizontal plane of the eyeball is measured. Two circles of the size of the natural eyeball are drawn upon cardboard, one giving a

PHOTOGRAPH — JOHN ROUTLEDGE.
Showing indicating apparatus and photographic plate in position.



RADIOGRAPH — JOHN ROUTLEDGE.
Tube nearly parallel with horizontal plane of indicators. Exposure 4 minutes.

RADIOGRAPH — JOHN ROUTLEDGE.
Tube below the plane of the indicators. Exposure 4 minutes.

horizontal view and the other a vertical section at the equator. Upon the circle representing the anterior view of the eyeball a line is drawn representing the distance the body is below the horizontal plane.

Taking the second negative with the tube placed about 30 degrees below, the distance the body is below the central indicator is entered upon the same circle, and the distance the body is above the temporal indicator is also marked. These points are joined by a line, and where this line cuts the line of the body below the horizontal is the position of the body in the eye as respects its vertical and horizontal location.

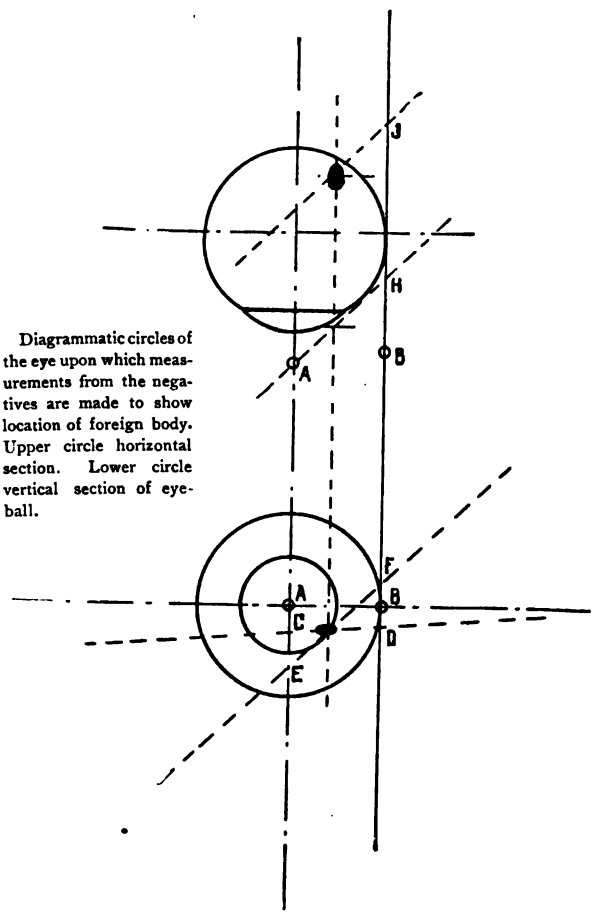
Again taking the negative made with the tube below the horizontal the distance that the shadow of the ball of the center indicator is behind that of the external indicator is measured and marked upon the line continuous with the external indicator.

A line is drawn from this point through the ball of the central indicator. This gives the direction of the rays from the tube. This line intersects the line drawn through the foreign body as shown on the first circle. From this point is measured back the distance that the body is shown on the negative, which gives the distance the body is behind the anterior section of the cornea.

Dr. William M. Sweet of Philadelphia, upon invitation, described the method employed by him in locating foreign bodies in the eye by means of the Roentgen rays. For this purpose, an indicating apparatus is used, carrying two steel rods, each with a rounded end. The indicators may be supported by a head band, and the plate held to the side of the head by an ordinary bandage. The balls of the indicator are at a known distance apart, one pointing to the center of the cornea, and at a known distance from the eyeball, while the other is parallel to the first towards the external canthus. The visual line is parallel to the indicators and to the plate. The two steel balls should also be perpendicular to the plate.

In making the negatives the tube is in front, about thirteen inches from the plate, and at an angle of from 15 to 40 degrees with a vertical plane passing through the apex of each cornea.

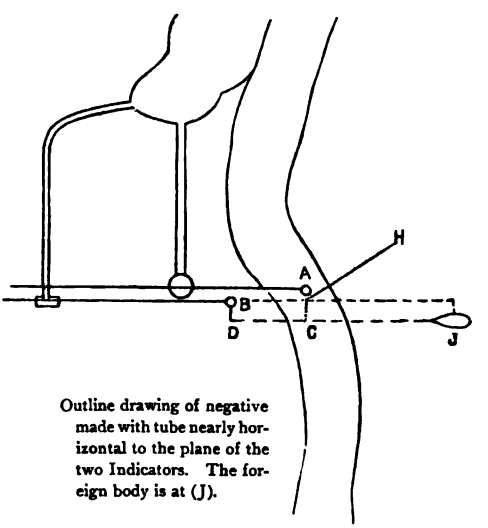
The plate is at the opposite side of the head, and the rays pass through the eyeball and the external orbital wall before reaching the sensitive film. Two exposures are made — one with the tube in a horizontal plane, or nearly so, with the two indi-



Diagrammatic circles of the eye upon which measurements from the negatives are made to show location of foreign body. Upper circle horizontal section. Lower circle vertical section of eyeball.

cators, and the second at any distance below. The angle of the tube below the horizontal is unimportant, so long as the two exposures give different relations of the indicators on the negatives.

In determining the position of the foreign body in the eye, two circles, 24 mm. in diameter, equivalent to the size of the globe, are drawn upon paper. One circle represents a horizontal section of the eyeball, and the other a vertical section. Upon the vertical section a spot (A) is made at the center of the circle, indicating the position of the central indicator of the apparatus. The distance between the two indicators is



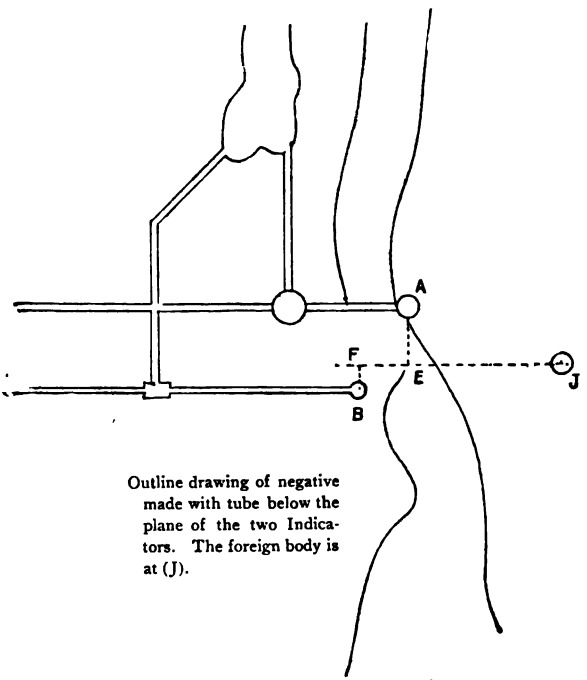
Outline drawing of negative made with tube nearly horizontal to the plane of the two Indicators. The foreign body is at (J).

measured toward the temporal side, and a spot (B) made to show the position of the external indicator.

On the circle representing a horizontal section of the eyeball, a spot (A) is made anterior to the center of the cornea, and at the same distance that the center indicator was from the eye when the radiograph was made. Another spot (B) to the temporal side, measured by the distance between the two balls of the apparatus, marks the situation of the external indicator.

Taking the first negative, with the tube nearly horizontal to the two indicators, we measure the distance of the foreign body below the two balls of the apparatus. These measurements (B to D and A to C) are indicated on the circle representing the vertical section of the eye, and a line is drawn

through the points (C, D). At some point along this line is situated the foreign body. From the second negative, made with the tube below the plane of the two indicators, the measurement is taken of the distance (A, E) the shadow of the foreign body is below the center indicator, and this point is indicated



Outline drawing of negative made with tube below the plane of the two Indicators. The foreign body is at (J).

on the first circle at (E). The distance the foreign body is above the external indicator (B, F) is measured, and the point indicated on the circle at (F). Where a line drawn through these two points crosses the line of measurements made from the first plate is the situation of the foreign body as respects its horizontal and vertical position in the eyeball.

To determine the distance of the foreign body behind the apex of the cornea, the negative made with the tube nearly horizontal is taken, and a measurement made of the distance the shadow of the center ball is posterior that of the external ball (B, H.) The distance is entered directly above the external

ball on the diagram representing the horizontal section of the eye. From this point (H) a line is drawn through the ball (A) of the center indicator, which indicates the direction of the rays from the tube when the exposure was made. Taking the negative again, we measure the distance that the shadow of the foreign body is back that of the external indicator. This distance (B, J) is marked perpendicularly to the spot representing the ball of the external indicator on the diagram, and a line is drawn parallel to the direction of the rays from the tube (A, H). Where this line cuts a line perpendicular to the position of the foreign body shown on the vertical section of the eyeball is the distance the foreign body is behind the anterior portion of the cornea.

In making the radiographs of Dr. Thomson's patient, the two indicators in each exposure were 12 mm. apart, while the ball of the center indicator was 4 mm. from the apex of the cornea. The external indicator, which should be perpendicular to the central one, was inadvertently placed 2 mm. nearer the eye than was the center ball. This difference is allowed for in entering the position of the balls on the diagrams. The exposures varied from three to four minutes in duration, a Queen self-regulating tube being used in the work. The principle upon which this tube is constructed enables the operator to secure a steady high vacuum in the bulb, giving great penetration by the rays of the eyeball and the surrounding muscular and bony structures. In this way, the shadow of the denser metallic body is more clearly shown upon the plate.

Employing the method described, the measurements from the negatives in this patient indicated the position of the center of the foreign body to be a point 20 mm. from the center of the cornea, 5 mm. to the temporal side, and 3 mm. below the horizontal plane. The negatives also gave the probable size of the body to be 4 mm. long, 2.5 mm. wide, and 1 mm. thick.

CONGENITAL EPICANTHUS AND PTOSIS.

BY DR. ROBERT SATTLER,

CINCINNATI, O.

The following cases of epicanthus associated with congenital ptosis are mentioned because unusual features were observed, at least, so far as my experience was concerned.

Ordinarily, epicanthus, even when associated with ptosis, is of little concern to us, because it is, in most instances, favorably influenced, or may disappear entirely without surgical interference as the development of the face, and in particular of the nasal bones, progresses with the growth of the individual.

It would appear, however, that in certain cases it may prove to be more than a simple deformity and interfere not alone with the comfort of the patient, but impede greatly the compensatory action of the occipito-frontalis muscles.

A professional colleague came to me about fifteen years ago, or several years before his marriage. At that time I examined the refraction of his eyes and corrected a high degree of ametropia. An operation for the relief of congenital ptosis and epicanthus had been made by Prof. Moxen of Düsseldorf during his boyhood, at the age of eight years.

The old Von Ammon operation for the epicanthus and a liberal excision of the skin with deep sutures for the ptosis was practiced. Both lids were perceptibly shortened and a slight degree of ectropion also remained. The loss of power of both levator muscles was complete.

The compensatory action of the accessory or occipito-frontalis muscle on both sides was imperfect, and in order to open the lids to secure better vision he was obliged to supplement it by a backward inclination of the head. Disuse had enfeebled the superior recti muscles and the action of the other muscles was also retarded and uncertain.

He contemplated marriage, but though the thought of the possible transmission of the troublesome deformity to his off-

spring brought consternation to his mind, he finally convinced himself that it was a justifiable act, for the reason that there had been no hereditary predisposition in his case, either on the part of his immediate or remote ancestry, to this or a similar or other deformity, and that it need therefore not necessarily affect his progeny.

I could neither concur nor take exception to this, and he followed the bent of his inclination and married. His wife was a healthy, well-developed woman, with excellent family history and record.

The issue of this marriage was four boys aged at present respectively, 12, 10, 8, and 6 years. All have congenital ptosis and epicanthus, as the accompanying photographs show.

With more than ordinary interest I have watched the development of these boys. At the proper time the ametropic states which my examination disclosed received the necessary optical correction.

The father had a high degree of compound myopic astigmatism. His sons without exception had hypermetropic refraction. The oldest a high degree of mixed astigmatism; the second compound hypermetropic astigmatism; the third simple hypermetropic astigmatism; and the youngest a simple hypermetropic of high degree. Aside from the optical error all had a certain degree of amblyopia.

The cranial conformation was brachy-cephalic: facial diameters broad; no other deformity or peculiarity about the head except a low insertion and deflection of the auricles in three of the boys. The nasal bones were fairly well developed in the three older ones, but even in the youngest one a better development has come about.

The ptosis was pronounced in all four and on both sides. The gratifying observation of increasing compensatory action of the occipito-frontalis muscles made on the two older boys was found to be taking place also in the younger ones.

This was the more surprising because it could be demonstrated conclusively that there was no independent action of the levator muscles. They were either entirely absent or imperfectly developed and therefore useless as elevators of the

lids. The opening of the palpebral fissure was effected wholly through the increasing power of the occipito-frontalis muscles aided by a natural or congenital shortening of the lid itself and an acquired relaxation of the facial muscles. The epicanthus which had been pronounced at birth did not change much even with a better development of the nasal bones, and in each child it proved to be later on a serious impediment to the action of the compensatory muscles, necessitating surgical treatment for its correction.

The direct sequence of this was displacement of the lachrymal punctum and inversion of the inner portion of the lid and its ciliary border, causing epiphora and distressing discomfort.

The compensatory action of the accessory levator muscles of the lids were in all four so favorable and satisfactory that the operation for the correction of the ptosis was both inexpedient and unnecessary.

It was evident, however, that the epicanthus interfered with and impeded the action of these muscles, and surgical interference was demanded.

In several cases of epicanthus in which the old Von Ammon operation was practiced, I became dissatisfied with the results obtained.

The youngest child had so much irritation from eversion of the cilia and from the dragging of the epicanthus fold interfering with the action of the accessory levators, that I planned an operative procedure, not new, and which doubtless others practiced before, but which in these cases fulfilled the purpose for which it was undertaken.

The epicanthal fold was seized between the branches of a forceps and horizontally divided. It was then thoroughly dissected and a small triangular piece excised upwards and downwards in the direction of the original fold. This permitted an easy coaptation of the wound, which was closed by a number of interrupted sutures. The subsequent scar served as a supplementary aid and increased the action of the occipito-frontalis.

The inversion of the lid border near the inner canthus was relieved by an excision of the skin near the margin and several sutures.

The results in the four cases have been satisfactory and all have been relieved of the unpleasant scratching and weeping and the action of the accessory muscles has been increased.

The other photograph is one of congenital ptosis with most marked epicanthus on both sides. In this case the action of the occipito-frontalis was also found surprisingly good, and an operation for the relief of the ptosis or drooping of the lid is hardly necessary.

What was noticed in the other four cases has also come about in this one, *i. e.*, inversion of the lid border near the inner canthus, with epiphora and constant irritation.

The same operation will be performed in this case. In connection with this subject I desire only to add a few words concerning the relative advantage of the operative procedures resorted to for the relief of ptosis.

I have altogether abandoned the old methods of skin excision, subcutaneous sutures, etc., and instead, have resorted either to the Panas operation or an advancement of the tendon of the levator.

The following photograph is a case of congenital ptosis without epicanthus in which the advancement operation was made on the left eye and the Panas operation on the right eye.

From this and other experiences with the Panas operation I would unhesitatingly recommend it as fulfilling, in suitable cases, the rational indication in the most satisfactory manner, and, therefore, justly to be preferred to other methods.

OPERATION FOR PTOSIS.

BY WILLIAM H. WILDER, M.D.,

CHICAGO, ILL.

In those slight cases of ptosis, either of the paralytic or congenital variety, in which the levator palpebrae still retains some of its power, the stitch operations of Pagenstecher or Dransart, for raising the lid by sutures passed from the margin of the lid beneath the skin to the eyebrow, or the ingenious

operation of Eversbusch for advancing the levator usually meet the requirements.

But in some cases of congenital ptosis it has been demonstrated that the levator of the lid is absent, and it is probably true that in most of them there is a faulty development of the muscle.

Again, the muscle may be powerless because of an anomalous or defective development of its nerve center, illustrations of which we have in those peculiar cases of congenital ptosis in which the drooping lid can be raised only in association with certain movements of the jaw.

In complete paralytic ptosis we cannot reasonably expect to gain the desired correction of the deformity by advancing a muscle that is absolutely powerless, and, at least in long standing cases, has suffered a partial atrophy.

In such cases the operation of Panas is largely practiced. The criticism justly urged against this valuable method is that in fixing the rectangular lid flap beneath the bridge flap, a raw surface is opposed to a skin surface with the result that after healing, a little pouch is formed beneath the eyebrow, in which dirt may accumulate to cause subsequent trouble.

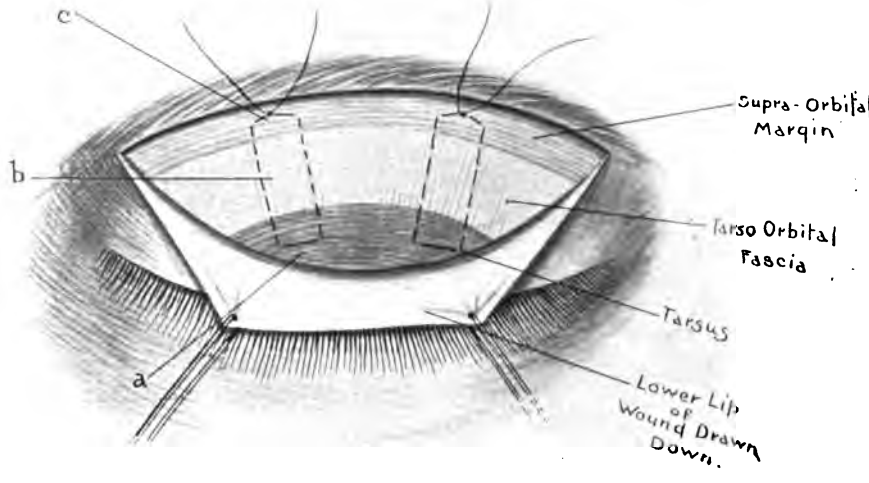
The ideal operation is that which will restore to the lid the power of opening and closing the palpebral fissure at will, but this from the very nature of many of the cases is impossible of attainment.

The result with which we must be satisfied, after most operations, is that in which the lid is held up so that the patient can use the eye and can also close it enough to give protection to the cornea, and this should be accomplished with the least possible deformity.

The operation here described, which I have done in a number of cases, accomplished this result fairly well. It is indicated particularly in those cases of congenital and paralytic ptosis in which the power of the levator is completely lost.

It consists in folding upon itself the tarso-orbital fascia as well as the aponeurosis of the levator which is intimately adherent to the fascia; and at the same time in establishing a secure connection of the upper lid to the firm tissues above the eyebrow.

E. H. AGE 36.
Complete Ptosis of Left Lid.
Operated Aug. 29, 1894.


c
b
a
Supra-Orbital Margin
Tarso Orbital Fascia
Tarsus
Lower Lip of Wound Drawn Down.

The tarso-orbital fascia extends from the margin of the orbit to the tarsus separating the connective tissue of the lid from that of the orbital cavity. Being a layer of deep fascia, it is continuous with the periosteum, and the upper part of it acts as a suspensory ligament for the upper lid.

By shortening this ligament the lid may be raised as much as desired.

After shaving the eyebrow, an incision is made a little above the orbital margin, but parallel with it, through all the tissues down to the periosteum.

This incision may be one inch and a half, or even more, in length, but should be so placed that the resulting scar will be concealed by the eyebrow.

A retractor being used to draw down the lower lip of the wound, the skin and muscle are separated from the fascia by careful dissection until the tarsus is brought into view. This is more easily accomplished if an assistant puts the lid on the stretch. Sutures of fine sterilized catgut or silk armed at each end with a curved needle are passed in the following manner. The first needle is introduced deep enough into the tarsus to secure a firm hold at a point about at the junction of the outer and middle third and a little distance from its convex edge. (Fig. *a*.) It is then drawn through, and with it several gathering stitches (*b*) are taken in the tarso-orbital fascia, after which the needle is made to pass through the muscle and connective tissue of the upper lip of the wound. (*c*.)

The other needle on the same suture follows a parallel course in the same manner, entering the tarsus about 3 mm. from the point of entrance of the first, then gathering the fascia into small folds and emerging in the tissue above, thus making a loop by which the lid may be drawn up. (*c*.)

The second suture is passed in the same way, making a loop at the junction of the middle and inner thirds of the tarsus.

The requisite elevation of the lid may be now secured by drawing on the loops and tying the sutures, which are to be buried in the wound.

The lower lip of the wound is now united to the upper with

fine sutures. The slight scar that remains after healing is almost entirely hidden when the eyebrow grows again.

The buried sutures become encapsuled and give additional strength to the folds of fascia that hold up the lid.

The orbicularis is uninjured so that the patient retains to a certain extent the power of closing the lid.

The oozing should be carefully checked before the wound is finally closed to prevent extravasation into the surrounding tissues and into the pouch formed by the dissection of the tissues from the fascia. Such a swelling may defeat the operation by causing the buried sutures to break their fastenings, before the folds of fascia have become firmly united to each other and to the margin of the orbit. To still further guard against such an accident and to give the lid temporary support until the deep parts have healed, the lid and the brow may be painted with collodion, or a small pad of cotton may be so placed in the dressing as to relieve undue traction on the sutures.

In one case upon which I operated, that of the boy whose picture is exhibited, suppuration followed because of some neglect or error in the antiseptic details, and an abscess developed in the upper lid which required drainage and irrigation, but this did not seem to impair the final result, although one of the buried sutures came away.

Within the last three and a half years I have practiced this operation, with a slight variation in detail, on thirteen cases, with sufficient degree of success to assure me that when properly done, it very satisfactorily corrects the deformity.

Most of the cases passed from my observation soon after they had recovered, and I am unable to speak of their present condition, but, judging from those whose pictures I show, I have reason to believe that the result is a permanent and satisfactory one.

It is true the number of cases is not large, but they show that complete ptosis may be relieved by shortening the suspensory ligament of the lid with buried sutures.

C. W. AGE 15.
Congenital Ptosis of Right Lid.
Operated February, 1896.

C. W.
One year after the operation.

RESECTION AND ADVANCEMENT OF THE LEVATOR PALPABRÆ MUSCLE IN TRAUMATIC PTOSIS.

BY CHARLES A. OLIVER, A.M., M.D.,

PHILADELPHIA, PENN.

This brief practical paper is based upon two observations that have recently occurred in the writer's practice. The first, which has appeared elsewhere,* will be merely referred to, while the second, which forms the basis of the present paper, and which has never appeared before, will be described in detail.

R. B. P., a healthy, five-year-old boy, without any history of relevant dyscrasia, applied at my clinical service at Wills' Eye Hospital on the eighth day of February of the present year, with the history that two weeks previously he had fallen upon a pair of large scissors in such a way that an open blade had penetrated through the lower lid into the inferior conjunctival cul-de-sac. The instrument passed across the face of the eyeball, and inflicted a deep, jagged wound beneath the upper lid in the superior cul-de-sac. When the accident first occurred the patient was placed under the judicious care of Dr. Oliver B. Sterner, who lived in the neighborhood, atropine and rest being used, which soon relieved all signs of active inflammation.

At the time of my first examination there was a firmly united and smooth linear scar in the lower lid, situated about five millimeters' distance from the ciliary border. It extended from about four millimeters' distance from the external canthus to about one millimeter from a point corresponding with the lower canaliculus. The inferior cul-de-sac showed faint traces of irregular cicatrization in a corresponding position. The eyeball was uninjured and undisturbed, except that its upward movements were restricted. In the upper cul-de-sac, extending nearly its entire length, there were dense, narrow, and irregular cicatrization masses, which, although binding the globe to the up-

* Annals of Ophthalmology, April, 1897.

per part of the lid, did not produce any visible scar. There was almost complete ptosis, the eyeball being covered. The lid could be elevated by the compensating action of the occipito-frontalis muscle to a degree sufficient to expose about three millimeters' width of the palpebral fissure. There was artificial mydriasis, allowing the eye-ground, which was healthy, to be plainly seen.

The left eye and its surroundings were normal.

A few days later the patient was admitted into the wards of the hospital, and, on the seventeenth day of the month, the following operation was performed while the patient was under the general anesthetic influence of ether.

A curvilinear incision about five millimeters above and parallel with the upper border of the uninjured tarsus (which could be felt through the overlying skin) was made through the junction of the middle and the upper thirds of the upper lid.

The upper skin flap was sufficiently dissected to allow access to the underlying tissue. The fibers of the orbicularis muscle were reached and teazed apart, and, after much dissection upwards and backwards, the torn ragged ends of the levator muscle were reached. These, after being secured by two sutures, were freed from a mass of false attachments situated far up and in from the lid itself. All loose and useless tissue material was excised, leaving a clean, open wound, into which the tendinous extremity of the levator muscle protruded.

The sutures in the tendon of the levator muscle were carried through the upper portion of the undisturbed tarsus and tied, thus attaching the muscle into its proper position. The overlying tissues were replaced and the skin wound was approximated by five superficial stitches. The operative field was cleansed and covered with a bandage.

Two days later the bulbar conjunctiva above the situation of the tarsus and in the cul-de-sac became almost completely herniaed, forcing itself through the palpebral fissure as a protuberant mass. All the sutures were removed. The wound rapidly healed.

The eye was allowed to become quiet until the fifth of March, when a successful attempt to replace and reform the conjunctival cul-de-sac was accomplished by the following

method. A linear incision passing the length of the middle line of the skin surface of the upper lid was made with a Beer knife. The cut was extended sufficiently to include the skin, the orbicularis fibers, and the upper third of the tarsus, directly down to the mucus membrane. Care was taken that the conjunctiva was not ruptured. The tarsal conjunctiva was forced into place by catching a hold of its upper part through the lid wound, and the still protuberant portion above was evenly excised, allowing the escape of some protruding orbital fat.

Three deep sutures, each passing through the upper border of the lower portion of the incised tarsus, and then through a loop formed by the cut extremities of the tarsal and bulbar conjunctivæ were next made. This was followed by carrying the thread outwardly through the lower border of the upper portion of the tarsus and tying the ends together. By this procedure three incarcerated loops of the conjunctiva in the tarsus were obtained, thus securing a perfectly shaped superior cul-de-sac. The skin surfaces were then approximated by fine sutures, and the whole field of operation was cleansed and covered with an occlusive dressing.

In several days' time, the eye doing well, all of the stitches were removed. The eye appeared clear and uninjured and the lid was beginning to enjoy good movement.

Ten days after the operation a slight muco-purulent discharge from the conjunctiva, followed by a somewhat depressed ulcer in the upper inner corneal quadrant, extending deeply into lamella, appeared. This unforeseen condition, which was noticed by the resident surgeon, Dr. James C. Bloomfield, that morning, and which he stated had had a slight hypopyon lasting for a few hours associated with it, was soon combatted by the use of careful cauterization of the entire circumference of the ulcerous area, associated with the employment of boracic acid wash, atropine, and hot stupes.

One week later, without any warning, and while the ulcer was becoming flatter and vascularized, a second discharge of pus into the anterior chamber suddenly appeared. Under the additional use of large antiperiodic doses of quinine this condition quickly subsided.

A week later the eye was quiet, the ulcer was healed, and the patient was able to raise the lid.

At the present writing the child has good use of the upper lid, there is free movement of the globe in all directions, and the area of corneal inflammation is barely visible.

Remarks. — The case has been considered worthy of report, not only upon account of the peculiarity of the traumatism, the methods adopted for the relief of the resultant condition, but by reason of the extremely rare forms of complication that appeared and which were so successfully and permanently removed.

The escape of the eyeball from an injury which involved both conjunctival cul-de-sacs; the almost isolated though well recognizable muscle defect which demanded radical interference; the prolapse of the conjunctiva through the palpebral fissure (most probably due to rupture of the facial connections which are so intimately united with the levator palpebræ and the anterior extension of the capsule of tenon); the recurrent infectious corneal ulcers with depositions of pus into the anterior chamber; the speedy recovery with the free movements of the globe; and the ability to elevate the upperlid, all are of the utmost interest in the clinical study of the case.

DISCUSSION.

DR. SATTLER. — I would like to ask Dr. Norris if any examination was made of the adjacent pneumatic sinuses, or did the growth start from the os planum?

DR. NORRIS. — It started on the os planum and involved the lachrymal bone.

DR. SATTLER. — In my case it started in the sinus and projected back into the orbit towards the apex, crowding the eye out of the socket.

DR. E. FRIDENBERG, New York. — In regard to the buried sutures in the lid, I had occasion three or four years ago to use this method for a case of paralytic ptosis. I used three sutures, passing them beneath the skin near the lid margin, catching the orbital margin, reissuing and re-entering the skin at this point, knotting them at the lid margin, thus leaving the suture beneath the skin. No incision or section was made. The result was good, and the sutures have given no trouble. The case was presented to the New York Ophthalmological Society.

DR. J. O. TANSLEY, New York. — I would like to ask the author of the paper on paralytic ptosis if there was any danger of a cicatrix being formed between the frontalis muscle and the periosteum. If there is such union, I should think it would nullify the whole operation.

DR. W. H. WILDER, Chicago. — The sutures that are put in are supposed to catch all the tissues above the periosteum which will give a firm hold, and no harm is done even if the fibers of the frontalis are caught.

DR. TANSLEY. — You do not understand me. If the frontalis is caught in this cut going down to the periosteum, you are apt to have cicatricial union, which will prevent movement of the eyebrows. That is the only objection I see to it.

DR. SATTLER.—As I understand it, the sutures are put into the tendon of the muscle just as in the Panas operation. In all the Panas operations I have made the sutures have been put in as superficial as possible, and not deep enough to go through the periosteum.

DR. WILDER. — I have not found that essential at all. Nothing short of putting the sutures into firm tissue where they will not pull out will be satisfactory. In answer to Dr. Tansley, I have not observed any ill effects such as he alludes to; in fact, after the operation the patient is able to use the frontalis to a certain extent in raising the lid.

TROPHIC KERATITIS, WITH A CASE OCCURRING IN CAISSON DISEASE.

BY GEO. C. HARLAN, M.D.,

PHILADELPHIA, PENN.

J. B., aged 29, came to the eye clinic of the Pennsylvania Hospital, October 22, 1895. He had been employed on the construction of the bridge built across the Delaware by the Pennsylvania Railroad Company, and had worked in a caisson under an atmospheric pressure of from eighteen to thirty pounds. He had commenced in June and had worked in the caisson eight hours a day continuously until sixty feet below

the surface, and then six hours a day, three at a time with an intermission of three. Several of his fellow workmen had been taken from the caisson unconscious, one had died and one was paralyzed. We made a search for the latter, but were not successful. In the latter part of July, he suffered much from giddiness, debility, loss of appetite, and nausea, and finally with frequent vomiting. After the first of August, there was occasional numbness of the whole right side. Early in September, when he was obliged to quit work, the right eye commenced to be irritable and painful.

There was a superficial ulcer of the cornea about 3 mm. in diameter, near the outer border, with irregular ill-defined margins and a grayish infiltrated surface, and the whole cornea was steamy. There was a dense pericorneal zone, but no corneal vessels. Some slender posterior synechiae showed a moderate iritis. The fundus could not be seen. There was anæsthesia, almost complete, of the cornea and conjunctiva, and of all parts of the face supplied by the ophthalmic and superior maxillary branches of the fifth. There was also loss of taste on the right side of the tongue. There was no other sensory paralysis and no motor, unless a slight weakness of the masseter which was not positively determined. The temperature on the right side of the mouth was three-fifths of a degree higher than on the left.

Four days later the area of the ulcer had increased and a small hypopyon appeared, which, however, lasted only a few days, and by the middle of November there was a decided improvement in the condition of the cornea. The ulcer was filling up and there was a raised line of demarcation about its margins, and several small, deep, corneal vessels were noticed. On December 10th a well-defined opacity occupied the position of the ulcer and the whole cornea had become vascular. There was little or no improvement in sensation.

The only general treatment adopted was at first mercury and iodide, administered for about a month, with a view to the possibility of specific complication though there was no evidence of syphilis, and afterwards quinine and strychnia, with good diet and hospital care. Locally, atropia and boric acid, hot

stupes and an occlusive bandage were used. About the last of January, the patient's general condition had improved so much that he felt well enough to go to work and was allowed to leave the hospital; an ankyloblepharon having been first performed to insure protection to the insensitive cornea. He soon afterwards went to a distant city and his address could not be obtained.

It can hardly be claimed that exposure to irritants was a prime cause here, as the keratitis persisted for months after the cornea was carefully protected, though it is possible that if this had not been done the disease might have proved more destructive. Then, too, the iris was involved in the early stages before the corneal affection had reached its height.

Several subjects of interest are suggested by this case. The unusual cause of the disease, the influence, or the existence, of trophic nerves and the pathology of so-called neuroparalytic ophthalmia. Anæsthesia has been much less frequently recorded as a symptom of caisson disease than has motor paralysis, and both occur usually in the extremities; but the more important symptoms can always be referred to the brain and spinal cord. According to Dr. Bauer of St. Louis, "in grave cases there is paralysis of different degrees, from slight paresis to complete loss of sensation and motion," and "cerebral and spinal congestion, oedema of the arachnoid and softening of the brain and spinal cord" are found post-mortem. Some or all of these lesions, with, in some cases, the addition of more or less extensive extravasations of blood, were found in nine post-mortems of workmen who died during the building of the St. Louis and Brooklyn bridges.* The cerebral and spinal lesions are explained by Dr. Andrew H. Smith and others on the theory that the brain and spinal cord, being contained in bony cavities, are less exposed to the effects of increased atmospheric pressure, and that consequently blood is driven into them from the periphery and the soft tissues. However this may be, there is no doubt that intracranial lesions do occur, and they might readily involve the Gasserian ganglion, or the fifth nerve or its central nuclei.

*E. Hugh Snell. Compressed Air Illness.

The question of trophic nerves may be considered still unsettled. Of two recent prominent writers, Berger* says that "experimental and clinical researches seem to prove the existence of trophic fibres in the trigeminal"; while Knies† states that in neuro-paralytic keratitis "we evidently have to deal with a traumatic loss of substance which is infected from the conjunctival sac. The assumption of special trophic nerves is superfluous." The subject is by no means so easily disposed of as the latter author seems to imply, as any one who attempts to explore the mass of literature that has gathered about it will be ready to admit.

Charcot‡ says that "defective action of the nervous system has no direct immediate influence on the nutrition of peripheral parts; on the other hand, it is at least very probable that morbid excitation, irritation of nerves, or nerve centres will, under certain conditions, provoke the most various trophic troubles at a distance. Do these trophic lesions depend upon irritation of these hypothetic nerves, which anatomy does not recognize, and which are sometimes designated as *trophic nerves*?" The theory of special trophic nerves of which Samuel has been one of the chief advocates, Charcot, while he does not admit it, considers worthy of consideration because it explains better than any that preceded it the pathological phenomena observed in practice. He is inclined to attribute these phenomena to an irritation conveyed by sensitive fibres, but admits that the question still awaits solution.

According to Gowers§ "Nutrition of tissue elements is largely under the influence of the nervous system. Whether this influence is exerted through special 'trophic nerves,' or through the motor, the sensory, and especially through the vaso-motor nerves, is a question that has been much discussed and is still undecided. The balance of evidence is against the existence of special trophic nerves. In the case of the fifth nerve, acute trophic changes occur in the eyeball, chiefly when

* Mal des Yeux dans leurs Rapports avec la Pathologie generale.

† The Eye in General Diseases, p. 107.

‡ Mal. du Syst. Nerv., VI, p. 134.

§ Diseases of the Nervous System, Vol. I, p. 22.

the disease involves the Gasserian ganglion or the nerve in front of it." The author likens these changes to the acute trophic changes that occur in the skin.

The corneal lesions which follow section of the fifth nerve, or its paralysis from other cause, were formerly attributed to the loss of the trophic influence of this nerve, but since Snellen and Büttner reported that in their experiments on rabbits these lesions did not occur if the eye was protected, they have been quite generally attributed, at least in the text-books, to loss of sensation of the cornea and its consequent injury by external irritants. Numberless clinical cases have been recorded, and we have all met with such, which would prove this contention most satisfactorily, if there were not others which, if less numerous, are equally positive on the other side of the question and can be better explained by recourse to the older theory. They are too numerous also to be set aside as exceptions, and I have seen enough of them myself to make me quite sure, while still in doubt as to the true pathology of the disease, that the mechanical theory is insufficient. I wish merely to comment on some of these cases, without attempting to review the extensive literature of the subject, which would lead far beyond the limits of this paper and is, besides, familiar or accessible to all. The results of physiological experiments have been too various and even contradictory to be conclusive. What some experimenters have claimed to establish others have almost invariably failed to confirm, even if they have not reached opposite conclusions. Some have thought it proved that the keratitis is due to mechanical injury depending on loss of sensation; others that it is the result of depriving the cornea of the influence of trophic nerves; and still others that it a phenomenon, not of paralysis, but of irritation, while some authorities attribute it to a paralysis or an irritation of vaso-motor fibres as distinct from trophic, and in some experiments the removal of the superior cervical ganglion alone has caused the phenomenon in question, but in others has prevented its occurrence, even when the fifth nerve has been divided.

The cornea will sometimes slough, if exposed, though perfectly sensitive, but it will by no means always do so when

insensitive. An example of the former fact is found in the case of a farmer who came to me a few years ago with a corneal fistula due to complete peripheral paralysis of the facial from exposure to cold while filling his icehouse. The fifth nerve was quite healthy. The actual cautery and a protective compress restored the anterior chamber promptly, and a subsequent ankyloblepharon prevented any recurrence of the trouble. The lid margins were united a little to the nasal side of the middle, and the patient could see well enough for all his purposes, through a partial opening of the outer half of the commissure.

Among many examples of the resistance of a sensitive cornea to exposure may be mentioned the case of a patient whose eye had been completely exposed for six years by the entire destruction of the lid by a burn, but the cornea remained perfectly clear. As for the insensitive cornea, in a case that I reported some years ago* a haziness of about a fourth of the cornea, which occurred during the acute stage of an affection of the fifth nerve, probably gouty, was permanent, but the rest of the cornea remained clear and bright for years, though the sensation never returned. In absolute glaucoma, the insensitive cornea never sloughs or presents anything like the picture of neuro-paralytic keratitis. It may even remain clear. Proofs are not wanting that the sensibility of the cornea and the state of its nutrition are not necessarily associated. Instances of loss of corneal sensation without inflammation are not very infrequent; and so-called neuro-paralytic keratitis without loss of sensation has been observed.† So, also, we may have typical neuro-paralytic sloughing of the cornea without exposure.

In a case that I reported in the Philadelphia *Medical Times*,‡ the cornea, which had remained clear under prolonged exposure, commenced to suffer at the very time when it was protected by paralysis of the levator palpebrae. The cranial nerves were involved, one after another, in the progress of an extensive sarcomatous disease of the temporal bone. The patient, a

* Am. Journ. Med. Sci., CXXXIV.
† Arch. d'Ophthal., 1896, p. 757.
‡ Vol. IV, p. 166.

child three years of age, was brought to the Children's Hospital on August 4th with a purulent discharge from the ear, a large polypus in the meatus and a fluctuating swelling over the mastoid. There was complete paralysis of the facial and the left eye could not be closed. The cornea was clear and bright and, as the eye showed no symptoms of irritation, no means were adopted to protect it. More than three weeks later, August 29th, the disease involved the third pair and produced ptosis, and it was noticed at this time that the cornea was dim. On September 1st, three days afterwards, the whole cornea was hazy and its lower fourth was infiltrated. At the end of three more weeks, September 17th, there was a sloughing penetrating ulcer; as the child's mother said, "the eye seemed to be melting away." The little patient died a few days afterwards, but no post-mortem was allowed beyond a partial removal of the growth which had appeared externally.

Dr. Norris has reported to this Society* a case of neuroparalytic ophthalmia from intracranial disease in which the insensitive cornea sloughed, though it had been carefully protected.

Such cases are comparatively rare, but the positive proof that they offer that the cornea may suffer in connection with lesions of the fifth nerve, under conditions that exclude the mere loss of sensation as a cause, cannot be ignored. No doubt in some cases simple exposure, either with or without loss of sensation, particularly when combined with pressure, as in the case reported to the Society last year by Dr. Green, and as frequently occurs in exophthalmic goitre, is competent to induce destructive keratitis; but it is equally certain that in other cases inflammation of the cornea, and even of the deeper structures of the eye, occurs as an evident result of lesions of the fifth nerve, though exposure to external irritants can be positively excluded as a cause. It is well known that the cornea is not always involved alone, but even in the earlier stages of the disease the iris is often found to be affected; and in some experimental cases hypopyon has occurred, while the cornea remained sound and clear.†

* TRANS. AM. OPHTH. SOC., 1871.

† Duval and Laborde. Travaux de Laboratorie de Physiologie, 1885, p. 137.

Instead of the sloughing or ulcerative keratitis usually met with in this form of ophthalmia, an increase of nutritive action, resulting in vascular turgescence and hypertrophy, may occur, as is illustrated by the case of a farmer's wife, 44 years of age, who applied at the Wills Hospital with a painful affection of the left eye of which she had suffered for a year. The sight was gone and the patient complained of intense and constant pain in the eyeball, brow, and side of head. There was complete loss of sensation in the cornea and in all the other parts supplied by the fifth nerve, except a just perceptible sensitiveness of the ocular conjunctiva. There was no other paralysis and no indication of herpes. The palpebral conjunctiva was enormously thickened and the bulbar conjunctiva was engorged, while the cornea presented the densest pannus crassus that I have ever seen. The other eye was sound and the patient's general health was good.*

The literature of this disease includes comparatively few post-mortem examinations, but Serres, Romberg, Alison, Genkin, and Haase found lesions of the Gasserian ganglion,† de Schweinitz found the ciliary nerves normal, which points to a central cause though it does not exclude disease of the ganglion, and Duval and Laborde‡ claim to have proved by extensive experimentation that there is a bulbar central nucleus, lesion of which produces the same sensitive and nutritive alterations in the eye as follow intracranial section of the fifth nerve. Panas thinks that "we are authorized to conclude that neuroparalytic keratitis has its point of departure in an alteration of the Gasserian ganglion, or of the nuclei of the fifth pair,"—which is perhaps about as far as we can go confidently in the present state of our knowledge, leaving it still undecided whether this alteration is of a paralytic or an irritative character, and whether its effects are produced through the medium of sensitive, vaso-motor, or special trophic fibres.

* Am. Journ. Med. Sci., CXXXIV.

† Panas. Mal. des Yeux, VI, 259.

‡ Travaux de Laboratorie de Physiologie, p. 137.

LAW OF REFRACTION–CHANGE FOLLOWING INCREASE OR DECREASE OF BODY-WEIGHT.

BY CHARLES M. GOULD, A.M., M.D.,

PHILADELPHIA, PENN.

In starvation 97 per cent. of the fat of the body is lost before death, and of the remaining three per cent. the orbit always retains some, and a larger amount proportionally than other organs. This seems to indicate that the cushion of fat blanketing the eyeball posteriorly is of great importance to the function of vision, and, if so, it would appear natural that great increase or decrease of body-weight, consisting mostly in gain or loss of fat, might lead to changes of fat-deposits in the orbit, with consequent variations in pressure upon the eyeball. If to this consideration we add the noteworthy fact that a variation so small as that of one millimeter in the anteroposterior diameter of the eyeball produces the huge ametropic change of three diopters, we recognize how slight a difference in orbital pressure is required to account for a marked variation of refractive error. It is easily demonstrable that a difference of one or two diopters may be produced simply by increase or decrease of posterior pressure, without posterior staphyloma or in any way altering the total capacity of the eyeball, but simply by altering its shape. The equatorial diameter would be lengthened by a slight polar shortening, and *vice versa.* The ametropia of albinotic eyes shows this fact, produced by another mechanism.

These purely *à priori* thoughts had been in mind for years, and I had had a number of patients in which changes of refraction were suspected to be coincident or consequent upon changes in body-weight, but there were always some elements of doubt due to the facts that the patients had been previously examined by other oculists, that I might reasonably suspect they were due to my own carelessness, etc. Last spring, however, several cases came nearly together, and a study of the case-records appeared to warrant a tentative theory, or working

hypothesis of sufficient plausibility to justify making the suggestion public. I remember to have been often perplexed before the present suggestion occurred to me to account for decreases in myopia, etc. I by no means claim any great definiteness of result or any precise formulation of a law, except in general terms, and liable to modifications and exceptions. I myself have had one or two cases showing that if founded upon fact the rule is not invariable. It certainly could not be so because many complicating conditions and circumstances must occur and must be taken into account. With all due allowances and justifiable cautions, it seems to me that the thought is a reasonable one, and is given in order to be proved or disproved by the future observations of many. If it is true it will help to explain a number of perplexing cases and put us and our patients on guard. I am sure the common belief that myopia does not lessen is frequently disproved by facts. It has for years been my custom to expect refraction-changes consequent upon severe general illness, and it may be that at least in part these are mere corollaries of the theory under consideration.

In brief, my suggestion is as follows:

Great increase of body-weight may cause shortening of the anteroposterior diameter of the eyeball or alteration of curvature (increase of hyperopia, decrease of myopia, or similar changes of astigmatism), and, on the other hand, great decrease of body-weight may be coincident with lengthening of the eyeball (decrease of hyperopia, increase of myopia, or like changes of astigmatism).

A few cases * clinically illustrating this law, if it may be so called, are as follows:

CASE 3125. The patient was a man of 25, and was first examined March 11, 1894, with the following finding:

R. — Cyl. 0.25 ax. 20°.

L. — Sph. 5.50 — Cyl. 0.50 ax. 160°.

On March 22, 1897, I again tested the error, finding:

R. + Cyl. 0.37 ax. 105°.

L. — Sph. 4.75 = Cyl. 0.25 ax. 160°.

Since the first examination he had gained about thirty pounds

* All, of course, tested under mydriasis.

in weight, and the refraction-changes were in the right eye 0.62 D., and in the left 1.25 D. The case seems noteworthy because the change was twice as great in the highly myopic eye.

CASE 4034. The patient was a man of 32, and was examined in 1889 by an oculist whose record I can trust, and who prescribed:

R. — Sph. 4.00 — Cyl. 1.00 ax. 165°.

L. — Sph. 1.25 — Cyl. 1.00 ax. 90°.

In 1895, I found:

R. — Sph. 3.50 = Cyl. 1.00 ax. 160°.

L. — Cyl. 2.50 ax. 90°.

On March 24, 1896, I found:

R. — Sph. 2.75 — Cyl. 1.25 ax. 180°.

L. — Cyl. 2.25 ax. 90°.

During these seven years the patient has steadily gained in weight a total of about forty pounds. In this case it was the highly myopic eye that had decreased in myopia a total of at least one diopter, the left remaining comparatively unchanged.

CASE 1493. A woman of 25 was refracted in 1891, and the following error was found:

R. — Sph. 5.50 = Cyl. 1.00 ax. 5°.

L. — Sph. 5.50 — Cyl. 1.00 ax. 5°.

In 1897, the error was found to be:

R. — Sph. 4.75 — Cyl. 1.12 ax. 5°.

L. — Sph. 4.75 — Cyl. 1.37 ax. 5°.

In the meantime she had gained about thirty pounds in weight, the coincident loss of myopia being about 0.50 D.

CASE 4280. Miss B., 18 years of age, was refracted April 18, 1896, and found to have the following error of refraction:

R. — Sph. 0.25 + Cyl. 0.50 ax. 75.

L. — Sph. 0.25 + Cyl. 0.62 ax. 105.

On April 24, 1897, the refraction was found to be as follows:

R. + Sph. 0.50 + Cyl. 0.50 ax. 75.

L. + Sph. 0.25 + Cyl. 0.75 ax. 90.

During the year she had gained very much in health and flesh, but just how much the increase in weight was it is impossible to say.

CASE 4074. A boy of 13 was first refracted in November, 1895. At this time he was of normal height, but very fat, weighing about 175 pounds. On Feb. 19, 1897, he returned, complaining that he could not see the blackboard and other distant objects as plainly as formerly. Upon inquiry, the mother said that these complaints had been growing more frequent and more pronounced during the past two or three months during which hygienic and dietetic measures had been enforced to reduce his flesh. The treatment had been so successful that during this time he had lost probably about forty or fifty pounds in body-weight, and, in girth, the waist had fallen from 39½ inches to 34½ inches. At the same time his height had decidedly increased, the lessening of fat having been followed by a rapid gain in body-length.*

His refraction in 1895 was:

R. and L. the same = + Sph. 0.25 + Cyl. 0.75 ax. 90°.

Fifteen months later it was:

R. — Sph. 0.25 — Cyl. 0.75 ax. 180°.

L. — Sph. 0.25 — Cyl. 0.87 ax. 180°.

Thus there was a total change of refraction of fully two diopters accurately synchronous with the loss of flesh. Up to the time of "going to press" there has been no noteworthy change in refraction, although I have re-examined the eyes several times.

I could cite other cases apparently of the same kind, but these seem sufficiently illustrative of the theory suggested to stimulate the observation of others. An indirect, but striking, proof of the general truth of the theory set forth consists in the fact of the production of high degrees of compound hyperopic astigmatism in albinos due to the continuous lid-pressure. The albino seeks to shut out light by the lids, and the pressure lessens the anteroposterior diameter of the cornea and shortens the vertical meridian to an enormous degree.

* There is considerable indefiniteness as to the weight and height, but I secured from his tailor the waistband measurements.

THE DESIRABILITY OF A PERISCOPIC QUALITY IN CORRECTING LENSES.

BY C. M. CULVER, A.M., M.D.,

ALBANY, N. Y.

To some extent such a desirability seems generally conceded, but the extent does not appear to be great enough. The point that it is specially desired to make now is that such a quality can and ought to be often obtained. Simple spheric lenses are now-a-days mostly menisci and are mounted with the concave surface toward the eye. In cases of compound astigmatism, however, the prescriber is apt to combine the spheric lens that corrects the ametropia of the least ametropic meridian with the cylindric lens that corrects the astigmatism, of itself, making the latter concave when the eye is myopic in all meridians and convex when the eye is hyperopic in all meridians. In the case of an eye that is hyperopic by 1.00 D., in its vertical meridian and by 2.00 D., in its horizontal meridian, the usual prescription would be: Sph. + 1.00 ⌒ Cyl. + 1.00, axis vertical.* A better form of lens having the same optical power but being at the same time periscopic, has the formula:

Sph. + 2.00 ⌒ Cyl. — 1.00, axis horizontal. In case the eye is myopic by 1.00 D., in its horizontal meridian and by 2.00 D., in its vertical meridian, the usual formula is:

Sph. — 1.00 ⌒ Cyl. — 1.00, axis horizontal. A better one reads:

Sph. — 2.00 ⌒ Cyl. + 1.00, axis vertical.

The foregoing are but type cases, and the application of the principle involved may be made to manifold combinations of hyperopia, myopia, and emmetropia. In cases of simple astigmatism it is better to prescribe a compound, periscopic lens than one having only a plano-cylindric combination. Instead

* There exists a strong temptation to re-open here the discussion of the question of the best method of indicating the inclinations of axes of cylindric lenses. However, that method which is most used may be made to help the prescriber by suggesting the numeration of quadrants, the one that is used by Snellen, Landolt, Knapp, Standish, and myself, seems to me superior to the other, in the respect, among others, to which allusion has just been made.

of Cyl. + 1.00, axis vertical, it is better to write, Sph. + 1.00, ⌒ Cyl.—1.00 axis horizontal.

Instead of Cyl. — 1.00, axis horizontal, it is better to write, Sph. — 1.00 ⌒ Cyl. + 100, axis vertical.

While the formula for a correcting lens, prescribed according to what is here recommended, does not show at first glance the character of the ametropia present, it requires but a moment's thought to determine whether the concave or convex element is preponderant.

A NEW ACHROMATIC GLASS FOR CATARACT FOR FAR VISION, AND A BIFOCAL COMBINATION FOR FAR AND NEAR USE.

By WILLIAM THOMSON, M.D,

PHILADELPHIA, PENN.

I beg leave to present for your consideration this very useful bifocal achromatic correction, and call attention to its lightness, and its neat workmanship.

The case of cataract for which it was made required from

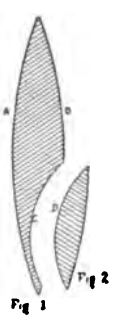


Fig 1 Fig 2

Fig 3

Fig 4

the test-box + 10^{s} ⌒ + 1.50^{c} ax. 180, to obtain the best vision. Javal gave corneal astigmatism = 2.50 D. with rule.

This combination is of toric form anteriorly, composed of + 6^{c} ax. 180, and + 4.50^{c} ax. 90″, and its posterior surface measures + 5.50 D. It is neutralized by — 10^{s} ⌒ — 1.50^{c} ax. 180

above, and by — 2.50^s below. To Mr. J. L. Borsch of Philadelphia I am indebted for the skill and knowledge to make such a combination, and I need only say that the base or main part of the lens is made from Crown glass, having index of 1.53, while the lower part is formed of flint, with its higher refracting power. A deep concave curvature is ground into the far glass, and in it is cemented the small lens of flint (Figs. 1 and 2). These curves depend on the result to be attained for the reading portion. The entire posterior surface is then ground on a spherical tool, producing a perfect and smooth surface.

The same principle was used to make an achromatic glass for far vision, except that the flint glass portion was placed in the center of the base lens, as shown in Fig. 4, and should be made large enough to give the patient as large a field as possible. These glasses were found to be perfectly achromatic, and gave the patient V. = $\frac{7}{6}$, and with + 3^s more placed in front, he read the type which should be seen at .25 c. m.

With the bifocal the far vision = $\frac{6}{6}$, and he read at 40 c. m. D. = 0.37 with the lower part.

TWO CASES OF MARKED AND RAPID CHANGE IN REFRACTION IN PATIENTS SUFFERING FROM GLYCOSURIA, ASSOCIATED WITH VARIATION IN THE AMOUNT OF SUGAR SECRETED IN THE URINE.

By S. D. RISLEY, M.D.,

PHILADELPHIA, PENN.,

Attending Surgeon Wills' Eye Hospital, Philadelphia; Professor of Diseases of the Eye, Philadelphia Polyclinic and College for Graduates in Medicine.

The following cases of saccharine diabetes, exhibiting remarkable changes in the refraction of the eyes associated with variation in the amount of sugar excreted with the urine, seems to the writer of sufficient interest to place upon record in the annals of the Society.

Mrs. S., aged 49, was sent to me by her physician, Dr. Ward, in November, 1882. She was the subject of glycosuria, but her physician reported that under treatment by the nitrate of uranium the sugar, which had been very abundant, the specific gravity of urine rising at times to 1050, had entirely disappeared. She no longer suffered from thirst, and the general health had greatly improved. She complained, however, that with the improvement in her general condition her vision had grown rapidly worse, so that she was not able to read or to see distant objects clearly with her glasses, + 2.75 D., although she had experienced no difficulty in this respect until within a few days. With her glasses V. O. D. $= \frac{1}{5}$, O. S. $= \frac{1}{4}$, and there was no range of accommodation. The optic nerves were very red, and the margins veiled, but no hemorrhages or splotches were present in the eyeground. The lenses were slightly opalescent, and the nucleus was plainly outlined in both, but there were no spicules of opacity or striae. The tension was normal, and the corneæ transparent. A mydriatic was instilled, and, after careful determination, she received for O. D. + 5. D.◯ + 1.25^{cy} ax. 75°. V. $= \frac{6}{vi}$. O. S. + 6. D. ◯ + .75^{cy} ax. 105°. V. $= \frac{6}{vi}$.

Ten days later the glycosuria had returned, and she complained once more of dim vision with her glasses, which were then reduced to 3. and 3.50 D. respectively, with cylinders as before, which gave her $\frac{6}{vi}$ in each eye. Accommodation was still absent. On the 31st of October, fifteen days later, the refraction had once more increased until she chose for O. D. + 1.25 D. ◯ + 1.25^{cy} ax. 75°. V. $= \frac{6}{vi}$. O. S. + 1.50 D. ◯ + .75^{cy} ax. 105°. V. $= \frac{6}{vi}$. The anterior chambers were shallow, the lenses strongly reflecting, but no opacity present. She remained under observation for several months with no further notable change in the ocular condition, but her general health failed rapidly under the persistent glycosuria, and the attending nutritional changes.

CASE II. Mr. W. C. S., aged 74. Has been suffering for at least six years from saccharine diabetes, under the professional care of Dr. James C. Wilson of Philadelphia. During that time the specific gravity of the urine has rarely fallen below

1020 and rarely risen above 1030. His treatment has been carefully conducted, and strictly carried out by an intelligent and loyal patient.

The condition of his eyes in August, 1896, was as follows: The refractional error was corrected by O. D. + 1.50 + 1.25^{cy} ax. 180° V. = $\frac{6}{vii}$½. O. S. + 1.25 + 1.25^{cy} ax. 180° V. = $\frac{6}{x}$.

The anterior chamber was shallow in each eye, and through the narrow pupil the eyeground could be seen with difficulty and all details were veiled. The pupils dilated small medium only with homatropine, but sufficient to reveal spicules of opacity in the lower half of both lenses, more advanced in the left eye. The nucleus was here plainly outlined, and with oblique light the lens seemed opalescent with plainly differentiated sectors. The eyeground was very fluffy in appearance, with gray-white splotches here and there through the fundus, and a large semi-atrophic crescent or conus embracing the lower temporal border of the optic nerves. These conditions were present in both eyes, but more advanced in O. S., and remained with but little variation until April 9, 1897, the vision on that date being recorded as O. D. $\frac{6}{vii}$½. O. S. $\frac{6}{x}$? *On April 23d* he complained of his dim vision for distant objects and inability to read even large type with his reading glasses. V. $\frac{6}{xxx}$ in each eye with his distant glasses. He expressed his surprise over his failing vision, in view of the fact that he was so much better in all other respects. Dr. Wilson reported the specific gravity of the urine as having fallen from an average of 1026 to 1012, on one occasion being as low as 1006, and no sugar or but a trace present.

He now selected O. D. + 2.50 ◯ + 1.25^{cy} ax. 180° V. = $\frac{6}{vii}$½. O. S. + 2. ◯ + 1.25^{cy} ax. 180° V. = $\frac{6}{x}$. There was no notable change in the fundus or lens of either eye.

On May 20, 1897, Mr. S. returned, saying that he had been compelled to return to his old glasses within a few days, as the new ones blurred his distant vision, and that the reading glasses compelled him to hold his book too close to the face. He now selected his old glass with each eye with which O. D. V. = $\frac{6}{vii}$½?. O. S. V. = $\frac{6}{x}$. There was a slightly diminished acuity of vision, therefore, in each, and in the O. S. the lens was

swollen and distinctly more opalescent. The specific gravity of the urine was 1027, and it contained 4.20 per cent. of sugar.

The probable cause for the rapid change in the refraction of the dioptric system of the eye in these two cases furnishes a most interesting inquiry, any answer to which, however, must be purely hypothetical. It is highly probable that the unstable equilibrium of the transparent component cells of the crystalline lens would be readily disturbed by qualitative change in its environing fluids, especially any change from the normal relative density or specific gravity of the tissue of the lens and the nutritive fluids in which it is bathed. It is well known, for example, that the entrance into the tissues of the frog of rapidly diffusible substances, as chloride of sodium, naphthalin, and sugar, impairs the transparency of the lens, presumably because of some such change as suggested above in the osmotic qualities of the fluids in and around the lens. These considerations render it at least probable that in the cases here recorded the change in the density of the tissue fluids suggested by the varying amounts of sugar secreted with the urine was sufficient to disturb the physiological relation of osmosis in the lens, and by this means cause the observed changes in the refraction of the eye.

DISCUSSION.

DR. E. FRIDENBERG, New York. — The change of refraction in Dr. Risley's case can only be explained by alterations in the refractive index of the fluids of the eye, or in the action of the ciliary muscle, and the rapidity with which they took place would rather exclude the latter hypothesis. These changes are somewhat similar to those found in iritis, where there is also increase in the refraction of the eye, this explanation of the increase of myopia during iritis being first made by Dr. A. Schapringer of New York a few years ago. I think he also pointed out that similar changes should occur in diabetes, rapid changes in the amount of sugar in the blood postulating rapid changes in the refraction of the eye.

DR. SAMUEL THEOBALD, Baltimore. — In regard to Dr. Gould's cases, I think I am correct in my impression that in each one of them there was a considerable amount of astigmatism. My explanation, therefore, would differ from that which he gave, especially in those cases in which myopia diminished in

time. I think it is an observation that we have all made in compound myopic astigmatism that the eye, when first tested for glasses, appears to be more myopic than it really is and less astigmatic. Through the effort of the ciliary muscle to correct the astigmatism the most myopic meridian is made less myopic and the less myopic meridian more myopic. When we correct the astigmatism the tension of the ciliary muscle is lessened, and, after a time, there is a greater amount of astigmatism discoverable, but less myopia. In my experience the diminution of myopia when associated with a considerable amount of astigmatism is not an uncommon thing, and has no reference to variations in the body-weight.

DR. G. M. GOULD, Philadelphia. — I will only add that, as I said in the paper, the ciliary muscle was thoroughly paralyzed, and the oculist who makes such a difference as two diopters is certainly not exactly trustworthy.

DR. THEOBALD. — Dr. Gould does not seem to have under stood my point. I do not think that latent astigmatism is rendered manifest by the use of a mydriatic. The only way in which it is brought out is by wearing correcting glasses. One will still get more than the true myopia and less than the true astigmatism even with a mydriatic, but after the glasses have been worn for some time the ciliary spasm lets up and one then obtains the true refraction.

DR. GOULD. — What about the cases in which the reverse is the case?

DR. THEOBALD. — We all know that eyes lengthen; that needs no explanation.

DR. S. D. RISLEY, Philadelphia. — In this connection I wish to call attention to a case already reported, with cramp of the accommodation and esophoria, who selected + 1.25° ax. 90°. Under treatment the esophoria disappeared and the refraction of the horizontal meridian of the cornea diminished so that a much stronger correcting cylinder was required, + 2.50° ax. 90°. The ophthalmometer demostrated the fact that the increased astigmatism was due to a change in the corneal curvature. The explanation may be found in the relaxation of the laterally acting extraocular muscles, since the change of corneal curvature occurred simultaneously with the disappearance of the esophoria. In this instance the man was in perfect health, and there was no question of change in body-weight.

A SERIES OF CONSECUTIVE CATARACT OPERATIONS.

BY ROBERT L. RANDOLPH, M. D.,

BALTIMORE, MD.

Five years ago I reported in the *Bulletin of the Johns Hopkins Hospital* a series of fifty consecutive cataract operations. Of these fifty operations six were performed in a hospital. With the exception of eighteen the remaining twenty-six were among the poorer classes of a country population in Virginia and in a mining region in the western part of Maryland. This series, then, is chiefly interesting from the rather unusual conditions which surrounded most of the patients. For instance, the first case reported (Series I, Case 1) was operated on in a log cabin near Warrenton, Va., and the old man was nursed by his daughter, who saw him only at meal times and at night (she being in service), and as a consequence he was exposed not infrequently to risks during her absence. He went through the same experience a year later with his other eye, and, as in the first instance, obtained excellent vision. Case 8, in the same series, had been blind for three years, and lived at a remote point on a plantation in Virginia, and he was nursed by his wife. His cabin was too dark for the operation, and I put him on a cot and operated out in the yard. He was very timid and jumped when the iridectomy was performed, causing some loss of vitreous. He counted my fingers after the operation, and I assisted him up-stairs to a room next to the roof, as the only other room in the house opened out into the yard. He remained there a week, and at the end of that time was allowed to come down stairs. He subsequently obtained perfect vision. Case 39 (Series 1), was operated on in a cabin full of negro children, and he was looked after by his daughter. The result was most satisfactory. In this series of fifty, two failed to recover sight, and as the circumstances peculiar to these were rather unusual,

and as such might explain the failure, I shall relate the histories.

Case 49, woman 78 years old, had been troubled many years with dacryocystitis, more marked in the left eye than in the right. She had been blind from cataract for three years. Refused treatment for the lachrymal trouble, saying she was too weak and old to stand the pain incident upon the probing. She was made acquainted with the additional risk of a cataract operation performed on an eye when there was disease of the lachrymal sac. She was willing, however, to run the risk of infection from this source, so I operated on the least affected eye. The result was a perfect success. A year later she presented herself for operation upon the second eye. The operation was smooth and she counted fingers with ease immediately afterward. I left the city that evening, not expecting to see her again for two weeks. She was entrusted to the care of the physician who assisted me in the operation. It is well to state here that she belonged to a most ignorant class of white people, and, though nearly eighty years of age, was accustomed to going barefooted in warm weather. The first time I operated she had shown herself unmanageable and walked around the house three days after the operation. That was in the winter time. The second operation was in June last, and when I saw the patient two weeks after the operation, her physician told me that she got up out of bed the next day, tore the plaster off her good eye and came down stairs and sat in the yard and smoked her pipe. The second day after the operation she walked nearly a mile barefooted to see her daughter. Whatever were the causes which produced it, when I saw her the second time the eye was lost. It is impossible, then, to say whether to attribute the loss of the eye to infection from the mucocele or to carelessness and exposure after the operation. Before each operation the contents of the lachrymal sac were pressed out, and, as far as possible, the conjunctival sac was rendered aseptic by irrigating it with a solution of corrosive sublimate $\frac{1}{4000}$.

The second case (Case No. 47) is that of a man 61 years old. He had been subject for many years to rheumatism, and

had suffered also for a long time with varicose veins on both legs, and as a result of the latter condition his right leg was covered with an eczema. The blood-vessels at his wrists and temples were tortuous and hard. Left eye, total cataract and good field of vision for light. The operation was absolutely smooth, and after the delivery of the lens the patient could see my face and count fingers readily. I removed the speculum and closed the eye, putting on the usual bandage. Ten minutes later, and just before I was about to leave the house, he complained of violent pain in the eye. I suspected hemorrhage, and immediately removed the bandage to investigate. I found the latter soaked with blood. The mass of blood and protruding vitreous were cleaned away and strong pressure applied. On returning, six hours later, it was found that the oozing had continued and he was still suffering pain. The lids were opened and a clot of vitreous was discovered between the edges of the wound. This was removed, and after first irrigating the conjunctival sac with a very weak sublimate solution, a pressure bandage was applied. At my visit the next day I found the bandage quite moist, and there was every evidence that the oozing was persisting. I cleaned out the sac again and renewed the bandage. On the afternoon of the second day I saw him again and there were still signs of hemorrhage. The same course of treatment was pursued and on the third day I found the bandage clean. Of course he was told that vision was irrevocably gone from the onset of the hemorrhage. In nearly all cases of this class the cornea sloughs, but this termination I fortunately escaped. Hemorrhage after cataract extraction is rare. Dr. Knapp reports in a recent number of the *Archives of Ophthalmology* his only case. In my own case I can account for the hemorrhage only by the condition of the blood-vessels throughout the body. No doubt the vessels of the retina were tortuous and their walls atheromatous, and when the lens was removed and intraocular tension thereby lowered, the blood-vessel walls could not withstand the pressure from the increased volume of blood pouring into them, so they ruptured. The whole condition of the patient pointed to a diseased state of the circulatory apparatus. It is impossible to

guard against such a termination, though I should regard the general condition of the man as a contra-indication for operation upon the other eye, for no matter how smooth the operation might be, the chances are that hemorrhage would follow the delivery of the lens.

Out of this series then, all obtained useful vision but cases 47 and 49. Since the publication of this series, I have operated upon 147 cases, and the tabular statement is herewith appended. Two of the cases are especially interesting as being instances of maniacal excitement, possibly due to the use of atropine after the operation.

The first case was a colored man operated upon in the poorhouse of Mineral county, West Virginia. He was seventy-five years old, and had been practically helpless from cataract for a year. Atropine was instilled immediately after the operation. The next morning the physician, Dr. C. S. Hoffman of Keyser, West Virginia, was sent for, and he wrote me that the old fellow had gotten up during the night, torn the bandage off, secured a razor from one of the inmates of the room, and had gashed his throat in several places, and was bleeding profusely when found. In the excitement which followed, the eye was forgotten, and it was sometime before the bandage was replaced. He was quieted, and seven days later, that is on the eighth day after the operation, he disappeared from the poorhouse, and two months afterward was seen by Dr. Hoffman in Piedmont, West Virginia, twenty miles distant, where he was chopping wood, and apparently getting along with absolute comfort. It might be added that he was entirely blind in the other eye.

The other case was also a very old colored man (88 years old). The operation was simple extraction, and atropine was instilled as usual at the operation. Before daybreak of the next day he was a raving maniac, and had to be tied down to his bed. His bandage was torn off several times, and he was incessantly tossing his head from side to side, until that too had to be secured, so as to be as far as possible, immovable. I did not look at the eye, as I supposed that it was lost. He did not recover his reason for a week, and all that was done was to apply hot moist compresses to the eye. When he became rational and I was enabled to get a satisfactory view of the eye, I found

a rather small pupil, a slight prolapse, but very little pericorneal congestion. On the tenth day he seemed to be completely himself again, and as the eye evidently needed a mydriatic, one drop of a solution of atropine (4 gr. 3j) was instilled, and the nurse was instructed to repeat the dose at bedtime. When I returned to the hospital the next day, I found that during the night he had jumped out of the window, twenty feet from the ground, scaled a high iron-spiked fence, and was making off, when overtaken by an orderly. Notwithstanding all this exposure, he obtained 20/70 vision. Nothing was done for the prolapse, which flattened out entirely.

Another interesting case was where the anterior chamber remained open for seventeen days. I have seen explanations for this phenomenon, but none seem adequate. The operation was the combined one, and the wound had united about half way up on one side and the rest of the incision had remained open. More than once during these seventeen days a spatula was passed beneath the corneal flap, and it was easily seen that no union had taken place. The operation, so far as could be seen, appeared to have been normal; that is to say, there was not the slightest hitch in any of the steps. Atropine and compress bandage were employed, and two weeks after he left the hospital his vision was 20/200. Eight months later he returned to the hospital with serous iritis, and since then vision has been lost, though he has still light perception.

Iridectomy was performed in 102 cases and simple extraction in 42 cases. Soft cataract was operated upon by needling in three cases. In twenty-five cases the vision was not tested. Three of these cases were very young children, and any subjective test would have been very unreliable. The other twenty-two were ones which I had operated upon at a distance, and most of whom I saw only once after the operation. A number of cataract glasses were sent to them from which to make a selection, and in this way I learned to what extent the operation had benefited the patient. It will be seen from the table that the operation and healing process were uncomplicated in all of these cases and all obtained useful vision. The failures were as follows:

Case 54. The operation was smooth and when the bandage was removed she could see large objects in the room. This was on the seventh day. Two days later iritis of a very sluggish character developed, and in spite of all treatment, ended in closed pupil and light perception. Dr. H. Harlan of this city operated on the other eye and obtained good vision, but he told me that operation was also followed by iritis.

Case 72 had an exactly similar history.

Case 95 was one which I had treated for several months for dacryocystitis. Her left eye had been operated upon by a New York oculist two years previously, and the cause of the failure in the case of that eye was no doubt the same as in the case of the eye upon which I operated, for that eye too was affected with dacryocystitis. When first seen she had a fistulous opening which had been discharging for several months. Before operation she was under treatment for at least five months and the fistula had entirely disappeared and the epiphora had immensely improved, though the latter condition was still present to a slight extent. She understood the danger, but being totally blind in the other eye, wanted the operation performed. The cornea sloughed within a week after the operation.

The next case (127) was that of a man 81 years old. On opening the eye on the third day there was a very offensive discharge on the bandage and between the lids, and beginning clouding at the edge of the corneal wound. Vigorous local and constitutional treatment, however, prevented the corneal trouble from extending, and he was left with a clear cornea and closed pupil. I think that I could have converted this failure into a success (as in case 190) by iridotomy, but a few days before the proposed operation he was attacked with pneumonia and died on the eighth day.

The last case was that of an old colored man (case 128) and the history here was similar to cases 54 and 72.

In one case (male, both eyes, 62 and 63), the patient had good light perception, but after the extraction of the cataracts it was observed that while he could move about somewhat bet-

ter, his sight continued very poor, and this was explained by the existence of optic nerve atrophy in both eyes.

Case 53 was one where a cataractous lens (congenital) had undergone calcification, and presented a bright white mass in the pupil. The operation was simply for cosmetic purposes.

As to prolapse of the iris. In the 42 cases of simple extraction there were five prolapses. In three of these cases nothing was done, though in case 181 the prolapse looked as though it would extend through the entire wound. Under a compress bandage, however, and atropine, the hernia smoothed over, and she has now vision 20/40.

In case 182 the prolapse got worse from day to day, till it nearly filled the wound, and it continued bulging more and more. There was no hernia on the second day as the eye was inspected, but he had some little gush of tears on the second night, followed by pain, and a small hernia was visible the next day. On the eighth day, fearing that the eyeball would be permanently disfigured (to say nothing of loss of sight), the protruding iris was cut off. There is now not the slightest ecstasia of the cornea so far as can be seen, and the patient has 20/30 vision.

In these last two cases lachrymation and photophobia were present to a marked extent, and some little pain was felt at the time when the prolapse occurred, but after this pain is conspicuously absent. So far as could be seen there were no evidences of infection having occurred in any of the cases of prolapse. When I say evidences I mean cloudy media and exudates. Undoubtedly, the absence of infection in these and similar cases is to be attributed to the fact that the wound is filled with the protruded iris, and there is no way for the bacteria to make entrance into the anterior chamber, and, again, the profuse lachrymation which is usually present must be regarded as a more or less protection from a mechanical point of view. And I think that an examination of the statistics of simple extraction will disclose the fact that the failures are, as a rule, not associated with prolapse. In commenting upon the visual results, it will probably strike many as singular that 20/20 was obtained only three times; but this may be explained by

the fact that discission was performed only ten times. In all of the operations the incision was made well within the limbus of the cornea, and still a little further in at the top of the incision. The latter includes usually something less than half the circumference of the cornea. The instruments, with the exception of the knife, are boiled. The knife is allowed to remain in absolute alcohol for twenty minutes. The eyebrows and that side of the face are covered with a cloth saturated with a solution of sublimate 1–1000. Both the cocaine and atropine solutions are boiled. Small pledgets of cotton secured by sponge-holders and boiled are used to remove *debris* from the field of operation, such, for instance, as strings of mucus and small clots of blood. The unoperated eye is closed till the second day, and a small pad of sterilized absorbent cotton is placed on the operated eye, and over this a four-tail bandage. The eye is inspected on the second day, and earlier if there be unusual pain. The room is darkened, but not uncomfortably dark. The patient is allowed to get up on the second day, and the bandage is generally removed on the seventh day, though there was a time when I removed it earlier. The following is the arrangement of the visual results:

20/20,	3	cases.
20/30,	11	"
20/40,	33	"
20/70,	36	"
20/100,	25	"
20/200,	6	"
Vision not tested,	25	"
Atrophy Optic Nerve,	2	"
Cosmetic purposes,	1	"
Failures,	5	"
	147	
Successes in the First Series,	48	
Failures,	2	
Total number of cases,	197	

No.	Sex.	Age.	Health.	Cataract.	Operation.	Healing Process.	Duration Treatment.	Primary Vision.
51	Male	77	Good	Hard, R. E.	Iridectomy smooth	Uncomplicated	2 weeks	20/70
52	"	75	"	" "	" "	Mild iritis	2 "	20/100
53	"	36	"	Calcareous "	" "	Uncomplicated	2 "	Light perception
54	Female	56	"	Hard, L E.	" "	Iritis	6 "	" "
55	Male	71	"	" "	" "	Uncomplicated	2 "	20/30
56	Female	68	Bad	" "	Escape vitreous	Iritis	5 "	20/70
57	"	66	Good	" "	Iridectomy smooth	Uncomplicated	2 "	Not tested
58	"	72	"	" R. E.	" "	"	2 "	20/20
59	"	65	Bad	" L. E.	" "	Iritis	4 "	20/100
60	Male	70	Good	" R. E	" "	Uncomplicated	2 "	20/30
61	"	50	"	" "	" "	"	2 "	20/40
62	"	50	"	" L. E	" "	"	2 "	20/40
63	Female	55	"	" R. E.	" "	"	2 "	20/100
64	"	60	Bad	" "	" "	"	2 "	20/40
65	Male	55	Good	" L E.	" "	Mild iritis	5 "	20/70
66	Female	62	"	" "	" "	Uncomplicated	2 "	Not tested
67	Male	75	Bad	" "	Simple extr.	"	2 "	Atrophy
68	"	75	"	" R. E.	Iridectomy	"	2 "	O. Nerve
69	Female	60	Good	" "	"	"	2 "	20/40
70	"	..	"	" L. E.	"	"	2 "	20/70
71	"	66	"	" R. E.	"	Iritis	3 "	20/100
72	Male	80	"	" L. E.	"	Irido-cyclitis	8 "	Light perception
73	"	63	"	" "	"	Uncomplicated	2 "	20/30
74	"	66	"	" R. E.	"	"	2 "	20/20
75	Female	71	"	" L. E.	"	"	2 "	20/70
76	"	50	"	" R. E.	"	"	2 "	Not tested
77	"	61	"	" L. E.	"	Mild iritis	3 "	20/40
78	"	66	"	" R. E.	"	Uncomplicated	2 "	20/40
79	"	54	"	" L. E.	"	"	2 "	20/40
80	Male	75	"	" R. E.	"	"	2 "	20/70
81	"	71	"	" "	"	"	2 "	Not tested
82	Female	63	"	" L. E.	"	Vitr. lost; iritis	4 "	20/100
83	"	50	"	" "	"	Uncomplicated	2 "	20/70
84	"	51	"	" R. E.	"	"	2 "	20/40
85	Male	80	Bad	" "	"	"	5 "	20/100
86	"	54	Good	" "	"	"	2 "	20/70
87	"	..	"	" L. E.	"	"	2 "	20/40
88	"	66	"	" R. E.	"	"	2 "	Not tested
89	"	60	"	" L. E.	"	"	2 "	" "
90	"	57	"	" R. E.	"	"	2 "	20/40
91	"	51	"	" L E.	"	"	2 "	20/100
92	Female	47	"	" "	"	"	2 "	20/100
93	Male	55	"	" R. E.	"	"	2 "	20/70
94	"	71	"	" "	"	"	2 "	20/70
95	Female	65	Bad	" "	Escape vitreous	Irido-cyclitis	....	.....
96	"	52	Good	" L. E.	Iridectomy	Uncomplicated	3 "	20/200
97	"	53	"	" R. E.	"	"	3 "	Not tested
98	"	77	"	" L. E.	"	Iritis	4 "	20/100
99	Male	56	Bad	" R. E.	"	Uncomplicated	2 "	20/30
100	"	58	Good	" L. E.	"	"	2 "	Not tested
101	"	54	"	" R. E	"	"	2 "	20/40
102	"	46	"	" L. E.	"	"	2 "	20/70
103	Female	76	Bad	" R. E.	"	"	2 "	Not tested
104	"	64	Good	" "	"	"	3 "	20/40
105	Male	50	"	" "	"	"	2 "	20/70
106	"	65	Bad	" L. E.	"	"	2 "	20/70
107	Female	60	Good	" "	"	"	2 "	20/40
108	Male	72	"	" R. E.	"	"	2 "	20/40
109	Female	61	"	" L. E.	"	"	3 "	20/70
110	Male	79	"	" "	"	"	2 "	20/100
111	"	55	"	" R. E.	"	"	2 "	20/40
112	"	80	"	" L. E.	"	"	2 "	20/70
113	Female	56	"	" "	"	"	3 "	20/100
114	"	63	"	" "	"	"	3 "	Not tested
115	Male	72	"	" "	"	"	2 "	20/100
116	"	81	"	" "	"	"	2 "	20/70
117	Female	66	"	" R. E.	"	"	2 "	20/70
118	"	50	"	" "	"	"	2 "	20/40
119	"	49	"	" L. E.	"	"	2 "	20/100
120	"	48	"	" R. E.	"	"	3 "	20/70
121	"	53	"	" "	"	"	2 "	20/30
122	Male	68	"	" L. E.	"	"	2 "	20/40
123	"	64	"	" "	"	"	2 "	Not tested
124	Female	62	"	" "	"	"	2 "	" "
125	Male	7	Bad	Soft, R. E.	Needling	"	2 operat'ns	" "

No.	Sex.	Age.	Health.	Cataract.	Operation.	Healing Process.	Duration Treatment.	Primary Vision.
126	Male	7	Bad	Soft, L. E.	Needling	Uncomplicated	....	Not tested
127	"	81	"	Hard, L. E	Iridectomy	"	3 weeks	20/40
128	"	81	"	" R. E	"	Irido cyclitis	....	Light perception
129	"	22	Good	Soft, R. E.	Simple extr.	Uncomplicated	2 "	Not tested
130	"	30	"	" "	" "	"	2 "	20/200
131	"	44	"	Hard, L. E.	Iridectomy	"	2 "	20/100
132	"	4	"	Soft, "	Needling	"	....	Not tested
133	"	77	"	Hard, R E.	Combined	"	6 "	20/100
134	"	..	"	" L. E.	"	"	2 "	Not tested
135	Female	52	"	" R. E	"	"	2 "	20/200
136	Male	65	"	" "	"	"	2 "	20/70
137	Female	57	"	" L. E.	"	"	2 "	20/40
138	Male	69	"	" "	"	"	2 "	20/40
139	"	82	Bad	" "	"	Escape vitr.	3 "	20/70
140	"	34	Good	Soft, R. E.	Simple extr.	Uncomplicated	2 "	20/40
141	Female	51	"	Hard, "	"	"	2 "	22/70
142	"	31	"	" L. E.	"	"	2 "	20/40
143	"	45	"	" R. E.	"	"	2 "	20/200
144	Male	58	"	" "	"	"	2 "	20/100
145	"	..	"	" L. E	"	"	2 "	20/70
146	"	61	"	" "	"	Esc. vifr., iritis	4 "	20/30
147	Female	47	"	" R. E.	"	Uncomplicated	2 "	20/40
148	"	60	"	" "	"	"	2 "	Not tested
149	"	50	"	" L. E.	"	"	2 "	" "
150	Male	60	"	" "	"	"	2 "	20/40
151	"	55	"	" "	"	"	2 "	20/70
152	"	44	"	" "	"	"	2 "	20/70
153	"	48	"	" "	"	"	2 "	20/40
154	"	51	"	" R. E.	"	"	2 "	20/70
155	"	62	"	" "	"	"	2 "	20/70
156	Female	59	"	" "	"	"	2 "	20/100
157	"	71	"	" L. E.	"	"	2 "	20/70
158	"	73	"	" R. E.	"	"	2 "	20/40
159	Male	47	"	" "	"	"	2 "	20/30
160	Female	53	"	" "	"	"	2 "	Not tested
161	"	62	"	" "	"	"	2 "	20/30
162	"	50	"	" "	"	Iritis	4 "	20/100
163	"	58	"	" "	"	"	5 "	20/70
164	"	78	Bad	" L. E.	Iridectomy	"	7 "	Closed pupil
165	"	66	Good	" "	"	Uncomplicated	2 "	20/70
166	"	.	"	" R. E.	"	"	2 "	20/100
167	Male	68	"	" "	"	Ant. C. open	17 days	20/200
168	"	28	"	Soft, "	S. L. extr.	Uncomplicated	10 "	Not tested
169	Female	47	"	Hard, L. E	Simple extr.	"	2 weeks	20/40
170	"	80	Bad	" R. E.	Iridectomy	Iritis	5 "	20/200
171	"	65	Good	" "	"	Uncomplicated	2 "	20/70
172	Male	88	"	" L. E.	Simple extr.	Prolapse iris	3 "	20/100
173	Female	70	Bad	" R. E.	"	Iritis	4 "	20/70
174	"	..	"	" L. E.	Iridectomy	Uncomplicated	2 "	20/70
175	Male	44	Good	" R. E.	Simple extr.	"	3 "	20/40
176	"	48	"	" "	"	Prolapse	5 "	20/30
177	"	71	"	" "	Iridectomy	Uncomplicated	2 "	Not tested
178	Female	70	"	" "	"	"	2 "	20/100
179	"	61	"	" L. E.	"	"	2 "	20/40
180	"	67	"	" R. E.	"	Iritis	4 "	20/40
181	"	66	"	" L. E.	Simple extr.	Big prolapse	5 "	20/40
182	Male	7	"	" R. E.	"	"	4 "	20/30
183	Female	58	"	" "	Iridectomy	Uncomplicated	2 "	20/40
184	"	70	"	" "	"	"	2 "	Not tested
185	"	50	"	" "	Simple extr.	"	2 "	20/100
186	Male	67	"	" L. E.	Iridectomy	"	2 "	20/20
187	Female	77	Bad	" "	Simple extr.	"	2 "	20/100
188	"	..	"	" R E.	Iridectomy	Iritis	4 "	20/100
189	Male	83	Good	" L. E.	Simple extr.	Uncomplicated	2 "	Not tested
190	Female	80	"	" "	Iridectomy	Cl'sd pupil, but iridotomy gave	....	20/200
191	"	70	"	" R. E.	"	Uncomplicated	2 "	20/30
192	"	62	"	" "	"	"	2 "	20/70
193	Male	50	"	" "	Simple extr.	"	2 "	20/70
194	"	55	"	" "	"	"	2 "	Not tested
195	"	60	"	" "	"	"	2 "	20/100
196	"	72	"	" "	"	"	2 "	20/70
197	"	72	"	" L. E	"	"	2 "	20/70

HEMORRHAGE ATTENDING THE EXTRACTION OF CATARACT.

BY O. F. WADSWORTH, M.D.,

BOSTON, MASS.

The exact cause of hemorrhage attending the operation for extraction of cataract has remained an unsolved riddle. But our very ignorance as to the cause makes such cases interesting. The condition of the eyes and the age and health of the individuals who have been the subjects of this accident have presented very decided differences and probably the cause is not always the same. The cases observed in my own practice do not throw much light on the nature of the affection, yet they may serve with others as material to lead eventually to a satisfactory solution.

I. A man 80 years of age had been under observation for two or three years with slowly-maturing cataracts. During this time he had been repeatedly examined and, aside from the lenticular opacity, no defect found in the eyes. After an interval of some months he came again to the hospital, and a somewhat hasty examination showing the cataract, in the left eye at least, mature, was admitted and etherized. When the speculum was introduced it was noticed that the perforating veins of that eye were larger than usual, but the tension was not specially abnormal, although perhaps somewhat increased. Puncture and counter-puncture were in the scleral edge, the summit of the flap in the cornea. Almost immediately after the section was finished a small thread-like stream of blood was seen to flow upward across the lens from behind the lower border of the pupil, followed quickly by larger quantities which caused extensive prolapse of the iris and gaping of the wound. The eye was bandaged and subsequently atrophied. A few months later, when the patient desired operation on the other eye, it was found to have lost perception of light.

II. A sailor, 75 years of age, cataract in both eyes. Right eye sight failing one or two years, counts fingers at 17'. Left eye, sight failing four or five years, cataract quite dense, projection faulty; a number of superficial and several deep veins running backward from near the corneal edge and along its upper half forming an anastomosis about ½''' from the limbus; anterior chamber of good depth; T. normal. October 8, 1877, extraction L. Puncture and counter-puncture in sclera, the summit of the flap in clear cornea. Large iridectomy. Free division of capsule, a small amount of cortical following spontaneously the withdrawal of the cystotome. Brief and unsuccessful attempts to remove a portion of capsule by forceps. The speculum was raised so as not to press on the globe, and a moderate sized nucleus and some cortical was readily pressed out, but a considerable amount of cortical remained and several attempts to remove this by pressure through the lower lid were only partially successful. At a moment when no pressure was being made blood welled up from behind the iris, filled the anterior chamber and flowed out of the wound. After a few minutes the anterior chamber became partially free from blood and a bandage was applied. The following day the anterior chamber was again filled with blood and a clot distended the wound. The clot gradually protruded until the corneal flap was folded backward by it, and the whole cornea became densely infiltrated. The man was discharged at his own request on October 27th.

III. A man of 45 years, always well and strong. Right eye normal and with good vision. Left eye, mature cataract. He said this eye had been struck by a fork when he was a child, but he had experienced little inconvenience at the time and the sight had been failing only a year. There was no scar to be perceived. T. was normal, pupil active, he counted fingers at 1'–2' and projection was good. February 3, 1893. Simple extraction, the speculum removed as soon as the corneal section was completed. The lens was removed without difficulty, the pupil immediately became round and even. But within a few seconds, while the eye was still open, there was a sudden and great prolapse of the iris, attended by severe pain. The lids

were closed. Shortly, there was a large gush of fluid vitreous, followed soon by a smaller gush and this by a stream of blood which trickled down the cheek. The man was told of the condition of affairs, enucleation was advised and done. There was no excessive bleeding from the enucleation and the healing was normal. Although in this case the man's history so far as known was good, it is a significant circumstance that he is reported to have died suddenly of apoplexy within a year.

V. A man of 69, good general health, mature cataract of 2½ years duration in the left eye. Size and dilatability of pupil good, projection normal. Eight years before a cataract had been removed from the right eye by an experienced oculist, followed by sloughing of the cornea and panophthalmitis.

April 8, 1895. Simple extraction under cocaine. Section smooth, wholly in the cornea. Ecchymosis of conjunctiva where grasped by fixation forceps. Speculum removed after capsulotomy. The nucleus and a considerable amount of soft cortical removed without special manipulation. The iris prolapsed, but went back into place with slight stroking of the cornea, leaving a round, clear, central pupil. There was no apparent tendency to gaping of the wound or dilatation of the pupil, although the globe seemed a little more rounded out than usual. Eserine, $\frac{1}{10}$ per cent., dropped into the eye, a light pad wet with solution of bichloride laid over the lids and the bed rolled aside; to wait for a while before the bandage was applied. Some fifteen minutes later the patient complained of severe pain; the lower lid was found to be covered by a large amount of fluid vitreous, the iris extensively prolapsed in the gaping wound. A bandage was applied, he was given a subcutaneous injection of morphia, he had a chill. Three days later the prolapse had flattened, the lower part of the anterior chamber was of good depth, there was no blood in the pupil; but after another four days the prolapse had increased, and a fibrinous membrane was adherent to it and overlapped the upper part of the cornea. This membrane was snipped off with scissors; the prolapse was removed as completely as possible and only recurred slightly afterward. The bandage was continued till April

25th. May 2d there was a small amount of blood in the anterior chamber and a membrane tinged with blood stretching across the pupil. Very gradually the pupil was drawn upward. There was no tenderness. T. was slightly diminished. Twice the membrane in the pupil was divided to some extent by a knife needle, but the opening closed quickly; each time there was a small hemorrhage into the anterior chamber, which was readily absorbed. Until the time of his discharge, May 30th, there was perception of light.

V. An American woman, 75 years old, of good general health, cataracts in each eye, which had been recognized for three years. The front of the eyes appeared normal; there was a good depth of the anterior chambers; the irides were active; T. normal. There was sufficient vision in the left eye to enable her to find her way about with some difficulty. Projection good in both. The lenses presented numerous striae, with less opaque areas between them, and when the pupils were well dilated with homatropine a view of the fundus of the left eye, very imperfect, but enough to show that there were at least no very gross changes, was obtained.

Several days later (March 12, 1897) simple extraction R., under cocaine. The section was wholly in the cornea and quite smooth. The speculum was removed as soon as the section was completed, T-shaped division of capsule without difficulty and without displacement of the lens. Just at the end of the capsulotomy the patient complained of some pain, but she did not move, and neither then nor at any time during the operation was there any special contraction of the orbicularis or of the ocular muscles. On placing the spoon on the lower part of the limbus it was noticed that the eye was quite firm, and the probability of hemorrhage was mentioned. A rather large, slightly brownish lens, followed by a very small amount of cortical, was expelled by moderate pressure, with no prolapse of the iris. Almost immediately the wound was widely distended by vitreous and there was complaint of severe pain. The lids were closed and in one or two seconds a large amount of apparently healthy vitreous oozed out between them. A

pad wet with solution of bichloride was laid over the lids and a subcutaneous injection of morphia given. A few moments later blood was trickling out between the lids and running down over the cheek. The condition was explained, enucleation advised and agreed to. By the time etherization was complete a clot had formed in the wound so firm that it was not disturbed during the removal of the eye. The enucleation was attended by no unusual hemorrhage. Healing was normal. The eye was hardened and divided. Its cavity was filled with blood clot, which was situated in part beneath the extensively detached choroid. The few sections examined showed no apparent disease of the choroidal vessels.

Of these cases, the first may be regarded as suspicious before the operation. Too much reliance was placed on examination made some months before, and hence the examination at the time of operation was imperfect. When the discovery of the large perforating veins and doubtful tension was made the patient was already etherized and, on the whole, it seemed better to go on and operate. Had cocaine anæsthesia then been known it would still have been possible to make further examination of the functions of the eye; or had we then realized, as we do now, the comparative unimportance of complete maturity of the cataract the other eye might have been operated on instead, with perhaps better result.

The second case was certainly an unfavorable one. While the record does not mention the fact, I do not doubt that, under such circumstances, I operated only on the urgency of the patient. Whether even then it was justifiable may perhaps be a question. The other three cases presented no unfavorable symptom.

In none of the cases was there anything in the behaviour of the patient to contribute to the result, no undue restlessness, no squeezing of the lids, no sudden contraction of the ocular muscles. Possibly this may not be wholly true of the fourth case, the only one in which the hemorrhage did not occur during or immediately after the operation. This patient also was quiet so long as he was under observation; that there was no spasmodic contraction during the fifteen minutes that

elapsed between the time that he was moved to one side and his complaint of pain cannot positively be asserted.

Nor was there any want of smoothness in the course of the operation, except in the second case. Even in this case the introduction of forceps to seize the anterior capsule did not stir the lens from its position, and although the manipulation for removal of cortical was somewhat prolonged it was not excessive, and this case was the one in which the symptoms before operation were distinctly unfavorable. This case also was the only one in which there was an iridectomy. In the first case iridectomy was to have been a part of the operation, but hemorrhage ensued before that step was reached. In the last three cases the section was wholly in the cornea.

Preliminary iridectomy of the second eye has been more than once suggested as a measure of probable value when the first eye has been lost by hemorrhage, and cases have been reported in which such procedure has been successful. The following case shows that success may be attained without preliminary iridectomy, even when the general conditions are not favorable.

A woman of 66 was operated on by a colleague in the summer of 1896. Extraction was quickly followed by hemorrhage, and the eye shrank. The gentleman who had operated asked me to operate on the other eye. The patient stated she was in fair health, but she appeared much older than her years, was rather feeble, very thin, and much wrinkled. There was mature cataract, the pupil was fairly active, tension normal, projection somewhat doubtful. She was quite desirous to have the operation performed. January 8, 1897, simple extraction, under cocaine. The pupil dilated rather slowly to admit the passage of a fairly good-sized nucleus; a small amount of cortical was coaxed out. After extraction of the lens the eye seemed softer than usual. The iris returned to place readily. Eserine, $\frac{1}{10}\%$. The bandage was maintained for four days; the pupil was small, round, central. She returned home January 26th, sooner than I advised, the eye quiet, a little cortical in the upper part of the pupil, vision, .2.

CHOLESTERINE CRYSTALS IN THE OPAQUE LENS OF A CHILD.

BY L. A. W. ALLEMAN, M.D.,

BROOKLYN, N. Y.

Although cholesterine is normally present in the lens and may be found within the capsule of atrophic juvenile cataracts, the picture presented by the following case is sufficiently unusual to be of possible interest.

The patient, a child of twenty months, was brought to my clinic, in the Long Island College Hospital, in November, 1896. The mother gave the following history: Shortly after birth, a small white spot was noticed in the pupil of the right eye, which gradually increased in size. The child was taken to a neighboring physician, with whom, unfortunately, I have been unable to communicate, who told the mother that the child had a cataract, which, however, did not completely cover the eye, and that its vision was not entirely lost. The white spot became subsequently more noticeable, the child could no longer see with the right eye, and hence her visit to me.

The family history was negative, the child was, in other respects, healthy and normally developed, there was no history of injury at birth, the delivery was not instrumental.

Examination showed the lens in the right eye to be cloudy, the opacity being greater at the posterior portion, with a more transparent layer in front. Scattered through the lens, and more abundant in the central and more opaque portions, were numerous glistening particles, which, on oblique illumination, looked like a shower of gold, resembling cholesterine crystals as seen in the vitreous, but larger than those usually found there.

This picture varied with the direction of the light, and against the semi-transparent lens was strikingly beautiful. The particles were immovable, the iris reacted normally to light and the case looked like one of incomplete traumatic cataract, with no evidence of degeneration save the cholesterine.

I concluded that the appearance was due to the presence of cholesterine, in which opinion Dr. J. S. Prout, who saw the patient with me, concurred.

I determined on extraction, and on December second, freely lacerated the anterior capsule with a discission needle. A few of the crystals diffused themselves throughout the anterior chamber and deposited on the cornea, showing that a thin stratum of the lens must have been partially fluid.

Little swelling of the lens substance followed, and no reaction. The crystals had entirely disappeared from the anterior chamber by December sixth, and I removed as much as possible of the lens matter by suction; but a dense membrane remained which could not be drawn into the syringe and required considerable traction by the iris forceps to free from its peripheral attachment. Healing progressed uneventfully and gave a clear pupil with enough vision to enable the child to run about, with the other eye bandaged. No cholesterine crystals could be seen in the eye and a good reflex could be obtained from the fundus; but the patient was too restless to permit an ophthalmoscopic examination.

The lens matter was submitted to Dr. J. M. Van Cott for examination. He reported as follows: "Microscopic examination of the portion of the lens sent to me reveals many typical cholesterine crystals, which under polarized light, give characteristic appearances."

Cholesterine crystals have been found in the eye often enough to make these cases of no great interest. The vitreous is the most frequent location. Webster found it there five times in 45,572 patients.* From my own limited experience, I would conclude that it occurred more frequently than these statistics indicate. I have once seen cholesterine crystals in the vitreous of a young adult with normal vision and no other discoverable abnormality of the eye. My other cases have been old subjects with more or less impairment of vision. According to Macnamara, these cases are common in India, among patients operated on for cataract, by couching. The majority of reported cases of cholesterine in other portions of the eye,

* Webster.— Archives of Ophthal., XII, 178.

have been in eyes that have undergone degeneration after injury.

The non-traumatic cases in which the crystals have been found in the lens, were in the cortex of hyper-mature cataracts, or where the lens had undergone degeneration after inflammatory processes such as iritis and choroiditis.* Fuchs reports a severe irido-cyclitis after their liberation by an operation, which he attributes to the irritation of the iris by the crystals.†

I have never seen them present in the lens before, unless the glistening mica-schist reflex, sometimes seen on the surface of mature cataract, be cholesterine.

The above case differs from any I have seen reported, in that the crystals were present in a lens which had evidently only recently become opaque, and were most abundant in the firm undegenerated portions.

DISCUSSION.

DR. H. W. RING.— Listening to Dr. Randolph's paper, if I heard it correctly, I noticed that in speaking of his prolapses he said that he had used atropine. I had supposed that where the iris was pushing out through a wound anything that would have a tendency to pull it back was indicated, and therefore, have used eserine. That with pressure bandage has given good results. I should like to add my testimony to that in favor of using pressure bandage in such cases.

DR. LUCIEN HOWE, Buffalo.— We all appreciate, I think, that it is better to have our patients in the hospital than to operate under any such circumstances as Dr. Randolph describes. Occasionally, however, it is a question of having the patient remain blind or operating on him at his home. We can lessen the difficulties somewhat which restless patients cause if the globe is held by self-retaining fixation forceps. I have described a pair of forceps for that purpose (exhibiting forceps), by the use of which we can do away with the aid of an assistant. Or any assistant or nurse untrained to the work can steady the globe by simply resting one finger on the forceps as they lie on the cheek, and when the finger is lifted the globe is free. Unlike the straight forceps, these are to roll upward immediately, not in the field of operation at all.

* Loring.— Text-book of Ophthal., 156.

† Fuchs.— Text-book of Ophthal., p. 381.

DR. S. D. RISLEY, Philadelphia.— I was very much interested in Dr. Randolph's series of cases, and also in the interesting group presented by Mr. Wadsworth. I would like to ask Dr. Randolph for information on two points in the cases in which iritis occurred. First, on what day after the operative interference did iritis develop, and, second, as to what, in his judgment, was the cause of its occurrence ?

DR. RANDOLPH.— Were they cases of combined or simple operations ?

DR. RISLEY.— In either.

DR. RANDOLPH.— I think I stated in one case that the iritis showed itself on the eighth day; in the other I forget, but think it was several days after the operation. Infection from the wound I should say was the cause in all the cases I reported. I cannot account for them in any other way.

DR. RISLEY.— We all must have witnessed attacks of low grade iritis coming on about the seventh or eighth day, with adhesions between the iris and the remaining capsule, the eye remaining red a long time afterwards. I do not think the group I refer to can be classed among the infectious ones, but regard them as bearing a more or less definite relation to the rheumatic or gouty diathesis.

I have had one experience with profuse hemorrhage following extraction of cataract, and was struck by the similarity to that of Dr. Wadsworth's cases. The interesting question to my mind is, Why do these cases occur ? They are certainly unusual when we take into consideration the large number of extractions we do which are not followed by hemorrhage, and there must be some extraordinary cause for them. In the case occurring in my own experience I noticed that the perforating vessels were dilated and there was bad projection of light pointing to intraocular trouble, but tension was normal. The patient dies of cerebral apoplexy within a month. In my judgment such cases may be accounted for by disease of the blood vessel, in the eye itself.

The cases in which the hemorrhage occurs immediately, *i. e.*, during the operation, are comparatively rare, but those in which the bleeding comes on afterward are more numerous, and I feel sure if a careful study of many of these cases is made we shall find that they belong to the interesting group of patients with diseased blood vessels associated with lithæmia.

DR. S. B. ST. JOHN, Hartford, Conn.— I want to emphasize the possibility of getting along without an assistant. I have

never done a cataract operation that could not have been done without a skilled assistant; I do not believe that two brains can act as one. I have never had an accident happen during cataract operation that I thought was due to the lack of an assistant. I think part of my success in iridectomy without fixation of the eye is due to the fact that I always introduce cocaine into the anterior chamber before doing that operation. After making the corneal incision I put in two or three drops of cocaine, and telling the patient to look strongly down I draw the iris out and cut it without the patient giving signs of any pain. If we can eliminate that sharp pain, we can certainly get along without an assistant to fix the eyeball.

While on my feet, I wish to say a few words about a case of cataract extraction that I had within the last six weeks. The operation was perfectly smooth, I did a small iridectomy, and everything was so satisfactory that I attempted an experiment that I do not often make, that of asking the patient to tell time by the watch, which he did. He made an excellent recovery, but about four weeks after the operation that man had a mass of cortical matter in the pupil that reduced his vision to 3/70. He is improving, and I hope it will all absorb, but I never before experienced a mass of lens matter hiding away to come out afterwards to turn what looked like a brilliant success into a doubtful condition.

Dr. R. A. Reeve, Toronto.— I have had one case of transient mania after extraction, where atropine had not been used; good vision was finally secured after a third iritomy. I have had two cases of free hemorrhage incident to extraction, necessitating enucleation. In one of the patients, when operating on the fellow eye, I took the precaution to do a paracentesis first, and then a preliminary iridectomy. The extraction was free from accident and the result was satisfactory.

Dr. David Webster, New York.— I recently had an experience with extraction that seems to fit very well here with Dr. Wadsworth's paper. A week ago yesterday I operated upon a lady between 65 and 70 years of age who seemed to be quite well, and the eye was a favorable one for extraction, nothing the matter with it apparently except cataract, which was mature. I made the excision for simple extraction, removed the lens without difficulty, and the iris went back in its place. It was a central circular pupil with a little cortical in it, and I wish I had left it there. I made an attempt to remove the cortical by pressure with the thumb on the lower lid and counter-pressure at the upper lip of the wound. I was getting along very well when suddenly the wound gaped widely, the

vitreous presented and the quantity came out. I replaced the flap with a spatula. I suppose nearly one-third of the vitreous was lost. The eye was bandaged as usual, and I did not see the patient until the next morning, when I was informed that within an hour or two after the operation vomiting had commenced and continued ever since. The bandage was thoroughly saturated with blood. On removing the bandage I found it to be simply one large hardened blood clot. There was no bleeding from between the lids, however, at the time, the upper one seemed a little prominent possibly, but I did not open the eye until the next day. When I raised the lid I found a very large prolapse of the retina. The patient was informed of the state of affairs and consented to the removal of the eyeball, which is now in the hands of our pathologist, who, I hope, can explain how and why it occurred.

I wish to say a word about the speculum of Dr. Howe. To my mind it would be a dangerous instrument. Anyone who fixes the eye below by forceps, and attempts to keep it down against the efforts of the patient to raise it will probably meet with disaster. If the eye attempts to roll up, I try to follow it, for otherwise I should expect gaping of the wound and loss of vitreous.

DR. E. E. HOLT, Portland, Me.— My experience coincides with Dr. St. John's, except that I do not put cocaine into the anterior chamber because I seldom do an iridectomy.

DR. SAMUEL THEOBALD, Baltimore. — The little forceps that have been shown by Dr. Howe are almost the same, and the method of using them is the same, as those which Dr. Murdoch devised many years ago. The fact has probably escaped Dr. Howe's attention. Dr. Murdoch has been operating with his forceps for years.

There is one condition that none of the speakers has mentioned in describing the complication following cataract extraction but which I noticed four or five times in a hundred cases of extraction, which I reported lately to the Medical and Chirurgical Faculty of Maryland, and that is the occurrence of serous iritis or descemetitis. I had, as I say, four or five such cases, and I should think it is a condition occasionally met with by others.

I was interested in the point which Dr. St. John makes in regard to the practicability of operating for cataract, etc., without an assistant. I would like to ask him how long he finds it necessary to wait after instilling cocaine into the anterior chamber before performing the iridectomy.

DR. ST. JOHN.— About one or two minutes.

DR. JOHN GREEN, St. Louis.— The cases of hemorrhage reported to-day bring to my mind two cases that I remember with great distinctness. One of these cases occurred about twenty-five years ago, in a middle-aged man with complete cataract in one eye, the other eye being of highly myopic refraction, certainly more than 10 D. The shape and prominence of the eye which was affected with cataract indicated a similarly high grade of myopia; the field was perfect as regards perception of light. I was led to undertake the operation in the hope that, if successful, the removal of the lens would so far reduce the refraction to make the eye useful without correcting glasses. There was no accident in the first stage of the operation, but the division of the capsule was followed by a very prompt escape of the lens, and this was followed as promptly by a protrusion of vitreous. When all, or nearly all, the vitreous had come out of the eye there was a free gush of blood. The other case occurred perhaps 12 years ago. The case was a typical cataracta nigra in an old woman, who had lost the other eye many years before. Projection was uncertain, and the perception of light low, but to give her such chance as there was I performed the extraction, which was in no way complicated until after the escape of the lens, which was very large and of very dark color, the darkest I ever saw, and very well justified the name of black cataract. After the exit of the lens came the extrusion of the vitreous followed by a gush of blood.

I recall also a case of extensive recurring hemorrhage following extraction in an old man. It happened to be the first extraction I ever performed, but in looking back upon it I cannot charge myself with any special clumsiness in the operation. In this case the hemorrhage was into the anterior chamber, and during somewhat more than a month the recovery was retarded, and I was kept in a state of anxiety, because of recurrent hemorrhages into the anterior chamber, at times almost filling it. At the end of six weeks there was complete solution of the blood; the final result was entirely good.

I may be permitted to speak of another case that I have lately observed. The case was one of morgagnian cataract, in which I operated by an upward flap incision of small size, entirely in the cornea, with a very small iridectomy. The liquified cortex flowed out immediately upon the division of the capsule, and was followed by the rather small free nucleus. It is my habit to make preliminary measurements of the curvature of the cornea in all cases in which a corneal incision is to be made, and I may state that in this case the ophthalmometer gave prac-

tically no corneal astigmatism in either eye. In the eye operated upon it was zero, and in the other it was only 0.5 D. After recovery from the operation a re-measurement revealed twelve dioptries of corneal astigmatism. The refraction was corrected by a lens of + 3 D. sph. combined with + 12 D. cyl., axis of lens horizontal, with the result, v. = 15/30, and a few days later of 15/19. I have never known of such a grade of astigmatism being observed as a result of extraction. The healing was normal, and the cicatrix was inconspicuous, the pupil was central, and the coloboma small.

DR. J. E. WEEKS, New York.— I wish to say in regard to producing anæsthesia of the iris that I have followed the method advised by Dr. Koller of injecting one or two drops of a 2 per cent. solution of cocaine beneath the loose conjunctiva. I have used it in acute glaucoma, and also in cataract extractions, and the patients have not evidenced pain at the time of the operation. The injection should be made in the ocular conjunctiva just above the margin of the cornea.

DR. JOHN GREEN. — Dr. Williams asks me whether the measurements I gave were for central vision or at the periphery. I would say they were central, both for the opthalmometer and glasses.

DR. C. H. WILLIAMS, Boston. — In connection with the case of Dr. Green, I would say that I have a patient now who is wearing a + 12 D^{c}, but no spherical combined with it. This case also illustrates the point of hemorrhage occurring after extraction, with a secondary operation. The patient was a man of 84, who had had chronic bronchitis between 20 and 30 years. At the operation of extraction he did very well, so far as keeping quiet was concerned; but after the capsule was divided there was a projection of vitreous into the wound, and the lens was removed with a Critchett spoon. His constant coughing caused the wound to be opened twice in the course of convalescence, which resulted in an extreme irregularity in the cicatrix, the cornea showing more than this amount of astigmatism with Javal's ophthalmometer. The pupil, being much drawn up toward the wound and some capsule remaining in the pupil, a secondary operation was done. The secondary wound closed finely in three days, but he then got hold of his dumbbells and began exercising, which resulted in a hemorrhage that filled the anterior chamber so he had barely perception of light. The blood was slowly absorbed, and now there is only a little trace of it remaining. With his + 12 D^{c}, axis 160°, he gets vision a little better than 2/10.

DR. J. M. RAY, Louisville, Ky.—There are several points raised in Dr. Randolph's paper that are of very considerable interest. One is his reference to extraction in patients suffering with dacryo-cystitis. My experience with such cases has until recently been rather distressing; if I operated I lost the eye. Having had such bad results, I refused for some time to operate, but recently I encountered a case in which it seemed to me that something had to be done. The eye was hopelessly blind, and could not be made very much worse if the operation was a failure. I placed him in the hospital, and, after treating the lachrymal trouble for some time and getting it free of all pus, I determined to extract. At the time of the extraction I washed the sac with formal solution, 1–2000. I did a small iridectomy, and there were no complications during the operation. I carefully opened the eye next morning, and, finding the anterior chamber reformed, I took off the dressings and left the eye open, so that the wound could be washed and thus not so easily infected. The case went on to a good result. I think if we are careful in making a conjunctival flap in these cases, and open the eye early, we are not so apt to get infection of the wound. The conjunctival flap closes up the wound quickly and lessens the danger of infective material getting into the wound.

DR. C. H. WILLIAMS, Boston. — I would like to say one word more about the healing of those cases in which there is some chance of infection. The gentlemen of the society probably remember that my father was in the habit of making in many cases a Lebrun incision and then putting a small suture in the apex of the flap. I have had seven cases where I have made a simple extraction, and have left a small conjunctival flap attached to the upper part of the corneal wound, the wound being made so that it starts in the cornea and comes out in the sclero-corneal junction, and the conjunctival flap is continued beyond that point, care being taken not to make it very large. I put in that flap from one to three sutures. The result is that the conjunctiva heals very quickly over the corneal opening, and the chance of infection is less than it would be if the opening was left in the usual way. The vascular conjunctival tissue heals more rapidly than the cornea, and in cases where we desire a rapid closing of the wound, the conjunctival flap, with a stitch, helps materially in securing that result. I get the finest silk that I can, and untwist it for my sutures. They usually cut out and disappear with the slight discharge from the eyes, but I have sometimes left them in place from five to seven days and then removed them easily under cocaine.

DR. LUCIEN HOWE, Buffalo. — I simply want to answer the objection of Dr. Webster, and call attention to the fact that when the patient attempts to close the lid, there is pressure on the speculum, which allows the forceps to move upward, thus partly following the upturning eye. The speculum is free from the objections made by both gentlemen, and is not like the one described by Dr. Murdoch.

DR. F. BULLER, Montreal. — Just a word as to the astigmatism after extraction of cataract. It seems to me an important question, for I have seen, as a rule, after extraction a considerable degree of astigmatism in eyes that were formerly nearly free from it. I have recently had a case in which the ophthalmometer showed an astigmatism of 14 D. in an eye which before the operation had showed none. That was a case of perfectly normal extraction, except that the wound did not close for three days. I am perfectly aware that even a small prolapse of the iris is apt to be associated with astigmatism of a considerable degree, but that does not account for the great amount often seen after normal extractions, and I would like to have some rational explanation of it. I am of the opinion myself that the higher degrees of astigmatism occur when the wound is entirely corneal, and that it is a point of advantage to have the wound rather behind the visible corneo-scleral junction.

DR. O. F. WADSWORTH, Boston. — Dr. Risley had referred to the supposition of localized affection of the blood vessels in the eye. It is difficult to resist the idea that there is such disturbance, but it has never been anatomically shown as yet. As to the question of atheroma of the arteries, it may be said that at the age at which most of our patients are operated on, they must have a certain amount of atheroma; so it does not really explain anything in the cases where there is hemorrhage. In one of my cases the patient was only 45 years old, and the other eye was perfectly normal. Of course, it is often better not to operate upon an eye so long as the other is perfectly good, but in this particular instance the man was a coachman, and it was important that he should have both eyes in order to see objects on either side.

Now just a word in regard to fixation during operation. Very early, before I myself had done any cataract extractions, it seemed to me that harm was sometimes done by too much fixation. It seemed to me it sometimes caused distortion of the eyeball by twisting or dragging, and my rule has been always to fix as little as possible. For the last few years I have removed the speculum as soon as the section was completed, and

I prefer not to have an assistant do anything, unless it is to drop in the disinfecting fluid. I think, as Dr. St. John has said, two brains will not work together as one.

DR. F. M. WILSON, Bridgeport, Conn. — This question of keeping the lips of the wound in apposition, which Dr. Williams has spoken of, in connection with the stitches, it seems to me is a very important thing, and anything that tends to accomplish it should be well discussed. In that line, and with the idea of preventing movement of the lips of the wound after extraction, I adopted six or eight months ago, through the influence of Snellen, the conjunctival flap My first experience was not satisfactory. I encountered a difficulty during the operation. It was my custom to take out the speculum and remove the lens by pressure on the lids. I found that the upper lid would co-aptate this flap and cause it to act like a plaster. I was often obliged to dislodge this flap with the spatula before I could extract the lens; so I have come to regard the flap as a very excellent means of holding the lips of the wound in place, but it does have a tendency to roll in, and one must be very careful to have the flap not too large and accurately, even microscopically, co-aptated Its power of holding the wound together is very great, even without stitches.

DR. JOSEPH A. WHITE, Richmond, Va. — I have been doing cataract extractions for a number of years, and, having ample clinical material, I have tried every method that has been suggested from time to time. As a result, I have come to the conclusion that a simple, clean operation, performed with the least possible assistance and with the least subsequent interference, is the best. So now I always proceed to do a simple extraction, unless forced to do an iridectomy, and, having lost all curiosity as to what the immediate results may be, I rarely look at the eye under four or five days. I arose, however, to call attention to the conjunctival flap. There are few surgical suggestions that may not be criticised in some way, and many are open to adverse criticism. This applies to the conjunctival flap. I have tried it, and my experience is not favorable to it. In the first place, it necessitates making the incision more peripheral, and, secondly, it almost always results in hemorrhage, which gets into the anterior chamber and interferes with the subsequent steps of the operation, the field of which should be perfectly clear in opening the capsule, removing the cortex, etc. Occasionally you may make a conjunctival flap without bleeding, but this is rare, and be the bleeding ever so little, it bothers you in completing your

operation. As I have long ago lost my fear of a prolapse of the vitreous, I now invariably remove the anterior capsule with forceps, for if you simply make an opening in it, there is almost sure to be a secondary cataract.

Dr. St. John has reported such a case as I have seen several times, following a good operation with a perfectly clean black pupil when the eye was bandaged; but four or five days afterwards the pupil was found filled with cortex. At first this bothered me, but I am not alarmed at it now, for after a few weeks it clears up perfectly. I have also long ago lost the alarm I experienced at the prolapse of the iris. I have found out that I gave myself needless anxiety. Nature is a great restorer, and I have for a long time made it a rule to let a prolapse of the iris alone. More eyes are lost by meddling with them than letting Nature do her work. The only cases of prolapse I have lost were those in which I followed the classical rules laid down and operated. Experience has been detrimental to my bump of reverence for standard authorities, and I fear I have now lost what little I had.

Dr. Robert L. Randolph, Baltimore. — As regards the use of eserine in cases of prolapse of the iris, there are probably strong theoretical reasons for employing this drug; but in my own experience it has always heightened the condition of irritation, and I doubt whether it ever pulls the iris into place. On the other hand, I have never found that atropine increased the hernia, but that its use was always followed by objective and subjective improvement. Of course the compress bandage was kept on.

As to iritis occurring on or about the eighth day, while Dr. Risley's explanation is a reasonable one, I am disposed to regard these cases also as instances of an infection, but of a milder character than was seen in the two cases where the cataract was associated with dacryocystitis. Where this last condition is present, we have near at hand pyogenic bacteria, and no doubt numbers of them, so that the appearance of iritis shortly after the operation is easily explained. But even where the conjunctiva is normal, bacteria are nearly always present, and just as soon as the corneal section is made, the fight between these bacteria and the tissues of the wounded area begins. In the majority of cases the natural resisting powers of the eye are sufficient to win the fight, and this in large measure accounts for the favorable results obtained as a rule in cataract extraction. In other cases, as, for instance, in the two cases of dacryocystitis, where pathogenic bacteria are present in unusual numbers, the eye succumbs and is lost, and finally, in a

third class of cases, — that is, where the iritis appears late, — it means that the organisms are present in somewhat fewer numbers, and are not so virulent; but, for all that, are capable of producing trouble.

I agree with Dr. White as to the treatment of a prolapsed iris. I let the prolapses alone, and, with one exception, they all flattened out. In one case I was compelled to cut off the protruding iris, and fortunately no infection ensued.

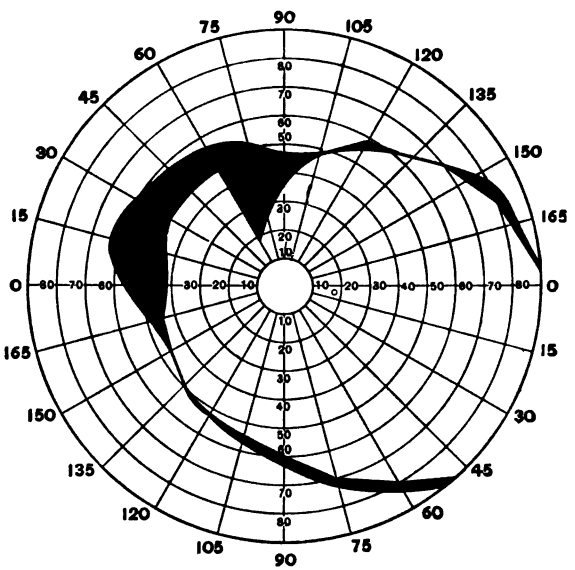
REMOVAL OF A PIECE OF STEEL FROM THE VITREOUS CHAMBER, THE POSITION OF THE FOREIGN BODY BEING DETERMINED BY THE PRESENCE OF A SCOTOMA IN THE FIELD OF VISION.

BY CHARLES A. OLIVER, A.M., M.D.,

PHILADELPHIA, PENN.

T. W., a forty-three-year-old worker in a rolling mill at Tacony in this city, reported at my clinic at Wills' Eye Hospital on the twenty-second of January of this year with the history of having been struck in the right eye by a steel-chipping the previous evening. He said that sixteen years previously he had had the eye injured in a similar way while he was in India, but he felt sure that nothing had penetrated the organ, and that although he had always been slightly nearsighted, yet the sight of two eyes had been alike until the second accident — since which time vision was practically lost in the injured eye.

Examination of the affected organ showed both tarsal and ciliary congestion. There was an irregular perforating wound of about two millimeters in length in the upper part of the cornea reaching to the limbus. The entire corneal membrane appeared somewhat hazed. The iris was thickened and discolored with a few almost imperceptible posterior synechia along its pupillary margin. In the upper portion of the iris in a position corresponding with the break in the cornea, there was a triangularly-shaped wound in the iris-tissue. The pupil was


90
75
105
60
120
45
135
30
150
15
165
0
165
15
150
30
135
45
120
60
105
75
90
80
70
60
50
40
30
20
10
0

irregularly round about three millimeters in its horizontal meridian and the iris was quite sluggish in action. The lens was apparently uninjured. The patient complained of decided tenderness when the ciliary zone in the region of the injury was gently palpated. No red-reflex, even after pupillary dilatation had been affected, could be obtained from the fundus, the vitreous chamber being filled with thick sheets of freshly extravasated blood.

With the exception of a few posterior synechia, a thickening of the iris-stroma, and a sluggishness of reaction to light (the marks of an old iritis as in other eye), the left eye failed to show any abnormality; its corrected vision being equal to $\frac{5}{5}$ and its field being normal.

Vision with the affected eye, which was obtained by my friend and assistant Dr. Edmund Canby, was limited to light-perception. The field of vision as shown in the accompanying chart revealed the presence of a sharply-defined absolute defect in its upper inner periphery.

Upon consultation, I proposed in view of the situation of the defect in the field of vision, to attempt to remove the supposed foreign body with a heavily charged electrode through an opening made rather far back through the sclera between the insertions of the external and inferior recti muscles. After agreement with the patient, that should I fail, I should be privileged to try to obtain a series of radiographs (to get which at the moment were impossible), I admitted him into the hospital wards, anesthetized him, and immediately proceeded to operation, with the result that the moment the magnetized electrode was brought to the wound-edge, the metal chip sprang out of the opening and attached itself to the electrode without the necessity of inserting the instrument into the eyeball at all. Not a drop of vitreous humor was lost.

There was not the slightest reaction and the after-treatment was uneventful. The vitreous extravasations which were found not to be very dense, gradually disappeared without causing any apparent disturbance, while vision for form and color increased until it is now rapidly approaching that of the fellow-eye.

TAXIS IN INCREASED INTRA-OCULAR TENSION.

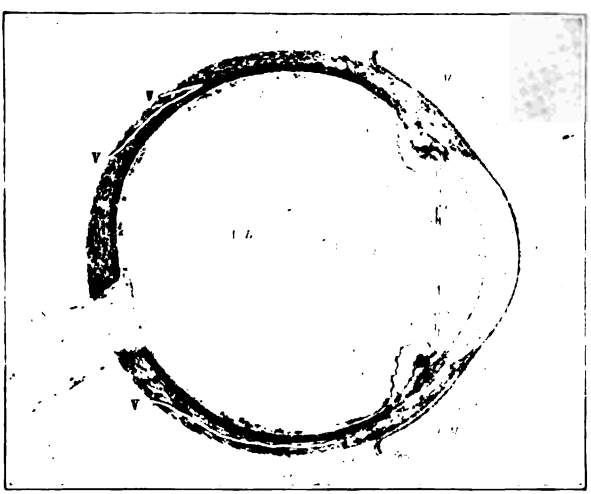
BY S. O. RICHEY, M.D.,

WASHINGTON, D. C.

The principal arteries of the globe enter it posteriorly, and pierce the sclerotic directly, limiting, as far as possible, resistance to the access of nutrient blood. On the other hand, the veins pass *very obliquely* through the sclerotic, in channels varying from 1.5 to 5.5 mm. in length, and contain no valves distal to their junction with the ophthalmic vein. The intra-ocular vessels have no vaso-constrictors, and the tension of the eye depends upon the pressure in the extra-ocular * arterial current; after death it is lowered. Given an abnormal propulsive force in the extra-ocular arterial current from any cause, and the increased influx of arterial blood raises intra-ocular pressure. So long as this influx does not exceed the ability of the venous system to remove it, the increased tension is within the limits of safety; but should there be any slowing of the outflow — that is, a loss of balance between the influx and the efflux of blood — a "vicious circle" is at once formed, which is more or less able to *break itself*, depending upon the less or greater violence and persistence of the general vascular excitement.

Unfortunately, from this point of view, the anatomical course through the sclerotic of the veins favors obstruction to the outflow of venous blood, they, for a limited part of their length, being parallel with the sclerotic and within its meshes; so that *any* increase of pressure within the eye *must* narrow their lumen, and diminish the outflow. This, in turn, adds to the existing intra-ocular pressure, farther reducing the calibre of the veins, and resulting in oedema of the surrounding tis-

* "Resistance of the eyeball to pressure is equal to 26 mm. Hg., and, pathologically, may reach 70 mm." (Norris & Oliver, System of Dis. of the Eye, Vol. I, p. 125.) "N. von Kries found arterial pressure in the cappillaries of the hand, when raised, to be equal to 24 mm. Hg.; when the hand hung down, 54 mm." (Physiol., Landois & Stirling, 2d ed., p. 151.)



A vertical section of the eyeball from before backwards enlarged five times. The white lines show the length of the venous channels in the sclerotic relative to the thickness of the sclerotic. They do not extend directly back, but backwards and downwards, and the proper anatomical entrance and exit of the largest channel cannot be shown in profile.

sues, conveying a false impression that glaucoma is due to a disturbance of intra-ocular *secretion.*

Venous stasis, in chronic glaucoma, if not relieved, results in thrombosis and connective-tissue hyperplasia, besides other recognized changes. The difficulties and uncertainties arising in the history and management of chronic glaucoma have their immediate cause in thrombosis of the choroidal veins, complete relief from which depends upon the length of time it has lasted, and the more or less permanency of the changes within the vessels from the presence of coagula; for organized tissue may have formed there, with final abolition of the calibre of the vessels, of which no mitigation is possible.

Previous to organization of the coagula and obliteration of the vein, during stasis, and even when thrombosis is recent, the flow of venous blood is favored, or the coagula may be broken up, passed into larger vessels, and redissolved by pressure upon the external surface of the eyeball, imitating the normal interrupted pressure upon it of the eyelids and of the intrinsic muscles and their tendons, and the contractions of the iris, which here, as elsewhere, promotes the movement onward of the current within the veins, and is antagonistic to stasis. This proceeding * I suggested and described at the meeting in 1896 of the American Ophthalmological Society under the name of *taxis*, because the movement of the fingers is the same as in reducing hernia. It is an imitation of a normal function adjusted to a condition of normal tension, and is necessary because this function of the lids and muscles requires aid in a state of high intra-ocular tension, with increased resistance to pressure.

It should be cautiously practiced when the coats of the vessels are weak, to guard against intra-ocular hemorrhage, the risk of which is small, except where hemorrhage is imminent, or has previously occurred. It will accomplish what may be achieved by operation, with the advantage that it may be repeated with recurrence of venous stasis and increased tension, which is a chronic tendency in chronic glaucoma.

* A paper on "Massage of the Eyeball as a Therapeutic Measure in Glaucoma," by Dr G. M. Gould, to be read at the meeting of the American Medical Association next month, is announced

That a myotic stimulates the iris to the production of this kind of pressure; that a mydriatic favors an attack of glaucoma by paralyzing the iris, thus allowing an advance of the vitreous body and lens, and consequent increased intra-ocular engorgement; that iridectomy, the force of the extra-ocular circulation being lessened, acts by temporarily relieving the pressure upon the surface of the veins, and permits them to disgorge themselves; that, *after iridectomy*, malignant glaucoma, intra-ocular hemorrhage, and failure of the anterior chamber to reform are caused by the persistence of undue *vis a tergo* in the extra-ocular arterial system, I am convinced.

This paper is an appeal to my colleagues to transfer their attention in glaucoma from the anterior channels of filtration to the fundus; from the relative amounts of secretion and excretion of the fluids in the eye to the influence of the vascular system, local and general; from a possible "vicious circle" in the anterior to a more rational vicious circle in the posterior section of the eyeball — satisfied that only thus will they find an acceptable solution to the many perplexing phenomena which have been observed in glaucoma.

RETINITIS PROLIFERANS.

By JOHN E. WEEKS, M.D.,

NEW YORK CITY.

The writer was led to a careful consideration of this affection of the eye, by having had an opportunity to examine microscopically two globes, which were the seat of changes due to this condition as well as a number of cases that did not come to section. Additional interest was given because of the close relation of this affection to retinal hemorrhages in the young and to retinitis striata. The histories of cases follows; also a résumé of the literature.

Ben. H., æ. 29 years, came under my observation July 3, 1893. Had a chancre four years previously, after which mercury and potassium were taken on advice of his physician. This was continued for one and a half years. Two years ago he

began to experience trouble with his eyes, consisting in inability to see objects distinctly. Obtained glasses which apparently gave him some relief. April 26, '93. The vision of the right eye was suddenly obscured and in a few moments totally abolished. On loss of the vision of the right eye, which before had been the better eye, the patient noticed that the vision of the left eye was quite defective. An ophthalmic surgeon was consulted who diagnosed extensive hemorrhage into the vitreous of the right eye and floating opacities in the left eye. St. Pr. Eyes quiet. Tension normal. The pupil of the right eye is slightly larger than that of the left. Right eye — field contracted above. No red reflex on ophthalmoscopic examination. The anterior chamber, iris, and lens apparently normal. The vitreous presents an impenetrable brownish haziness, with here and there some whitish membraneous masses. V. = $\frac{6}{200}$. Left eye — The margin of the disc on the nasal side is obscured by the presence of a band of connective tissue, which appears to be attached to the disc and sends out a few narrow digitations to the retina above and to the nasal side, for a short distance. The band extends downward and outward toward the equator of the eye where it spreads out and is lost in a broad white mass of tissue. It is apparently closely attached to the retina extending well forward toward the ciliary body. The band of tissue extends into the vitreous apparently about 2.5^{mm}. and at the equator. The large white area is composed of a number of narrow bands, some of which extend further into and are lost in the vitreous. A short distance below the margin of the disc an arterial branch wound up on to the band of tissue and followed it to the equator. A number of small vessels were observed winding in and out of the elevations and depressions in the mass in the lower part of the globe. The membraneous band in the lower part of the globe presented a faint resemblance to detached retina. The remainder of the disc was clear cut, the vessels slightly smaller than normal, and along the edges of some of the arteries narrow whitish lines were observed. Some small floating bodies in the vitreous were also observed. The floating bodies and the fibrous bands had undoubtedly followed hemorrhages into the vitreous from retinal vessels. Vision with correction, $\frac{20}{60}$ +.

July 13. The vision of the right eye suddenly fell to perception of light and there was a slight diminution of vision in the left eye. The condition of the right eye was caused by a fresh hemorrhage, that of the left to a slight quite diffuse haziness of the vitreous. The patient was put to bed. Potassium internally and mercury by inunction were given. At the end of five weeks the vision of the left eye had returned to $\frac{20}{30}$ + and the vision of the right eye was slightly improved. Feb. 11, '94. Three days previously failure in the vision in the left eye came on suddenly, no pain. General condition good. Potassium and the biniodide of mercury in moderate dose has been continued since July.

There is now a small hemorrhage into the vitreous which apparently originated from the blood vessels on or near the fibrous new formation. V.= $\frac{20}{40}$. Rest in bed was enjoined and pilocarpine was given. At the end of two weeks the hemorrhage and effusion of serum which accompanied it had absorbed and vision returned to $\frac{20}{30}$. In June of 1895, while in the West, patient had a hemorrhage into the vitreous of the left eye which reduced the vision to little more than perception of light. In November of '95, the vision of the left eye had returned to $\frac{20}{30}$ — with the correction. In August, '96, the vision of the left eye = $\frac{20}{30}$. Vision of the right eye $\frac{6}{200}$. The bands of connective tissue in the left eye remained unchanged, except perhaps that they were slightly increased. The right eye remained as when first seen.

There has never been any albumen or sugar in the urine. Heart action normal. Patient in good health except in regard to the eyes.

For the privilege of examining and reporting the following cases I am indebted to Dr. Peter Callan and Dr. Geo. H. Cocks.

Margaret B., æ. 26 years, came to the N. Y. Eye and Ear Infirmary in March, 1897. The father died at the age of twenty-nine years, cause unknown. Mother died at the age of forty-six years of nephritis. Patient has three sisters, all of whom are well and possess good vision. There is no history of syphilis in the family. The patient has enjoyed ordinary health but

has never menstruated. The vision of both eyes was good up to sixteen months ago, when the sight of the right eye suddenly failed; at the end of a few weeks vision had slightly improved. It again failed, and one year ago she could see nothing with that eye. There was no pain and the eye was not externally inflamed. The vision of the left eye began to fail about one year ago, but the patient could see to read up to six months ago. There has been no pain in the eye. St. Pr. The patient shows no sign of inherited or acquired syphilis. Pulse slow, heart normal. The urine contains a small amount of albumin. Right eye — Anterior chamber shallow. Pupil occluded. Iris atropic at its periphery; slightly bombé. Tension slightly reduced. Eye white; not painful on pressure. Lens cataractous. Vision nil. Left eye — Some deposits of pigment on the capsule of the lens from old synechiæ. There are numerous broad, thin, delicate, white membranes in the vitreous chamber, which are attached to the retina. Some of these bands bear blood vessels. The vitreous is hazy and the fundus is not distinctly visible. There are no gross floating bodies in the vitreous. Vision = $\frac{5}{200}$. Eye quiet.

Longitudinal section of globe in the case of Margaret B., showing detachment of the retina and filiform adhesions to choroid.

March 7, '97. The right eye was removed by Dr. Geo. H. Cocks and sent to the laboratory of the N. Y. Eye and Ear Infirmary for examination. After hardening, the globe was divided longitudinally. Macroscopical examination — Anterior chamber, iris and lens as stated above. Retina completely detached except at disc and ora serrata and drawn to posterior surface of lens. The convex posterior surface of the retina was attached to the choroid by a number of long connective tissue bands. The choroid was attached to the sclerotic throughout. On opening the globe, a grayish fluid containing many cholesterine crystals escaped. Nerve atrophic. The author has no doubt that this eye, which resembles the one whose anatomical features were described by Manz (Graefe's Arch., vol. xxvi, p.

55), was destroyed by the same process which now affects the left eye. The microscopical examination has not been made.

Harry Z., æ. 11 years, came to the N. Y. Eye and Ear Infirmary, Dr. Callan's clinic, March last. Patient healthy. No appearance or history of syphilis. Was struck on the left eye with a piece of wood last July, since which time a cataract has developed. Perception of light good. Right eye — The vision of this eye was good up to a few months ago, when it became "clouded," improved, and again failed. At present it equals $\frac{20}{200}$. St. Pr. Eye quiet. Blood vessels at the disc apparently normal. Wide, thin, white bands traverse the anterior half of the vitreous and are apparently attached to the retina. They are fixed. No blood vessels are observed on these bands. There is no evidence of an acute inflammation either past or present in the eye. The patient is still under observation.

The following history was kindly supplied by Dr. Geo. H. Cocks and appeared in the N. Y. Eye and Ear Infirmary Reports, 1897, p. 27:

Lloyd H., aged 8 years, first came under the care of Dr. Cocks at the Infirmary, service of Dr. F. D. Skeel. Sept. 11, 1896. Family history good. Father healthy. Mother has had three children, all of whom are living. One miscarriage. There is no history of, and no evidence of, syphilis in the family. The patient has been complaining of pain in the right eye for several weeks.

St. Pr. Right eye — V. = 0. Tension + 1. Iris fully dilated with atropine. A large dark brown mass is seen occupying a part of the vitreous chamber, completely obscuring the details of the fundus. Upward and onward a faint red reflex is seen. Diagnosis of probable sarcoma of the choroid was made. Left eye, V. = $\frac{20}{200}$ Floating bodies in the vitreous. October 12 — The pain in the right eye has been almost constant since the first examination. After consultation with Dr. Peter A. Callan and Dr. Frank D. Skeel it was decided to remove the eye, which was done by Dr. Cocks on the same afternoon. Healing normal. The globe was sent to the Pathological Laboratory for examination.

Through the courtesy of Dr. Cocks an ophthalmoscopic examination of the remaining eye (left eye) was made by the writer.

The cornea, anterior chamber, iris, and lens were normal. A number of delicate, dark, filiform, floating bodies were present in the vitreous, all of which were evidently the result of hemorrhage into the vitreous. They occupied the vitreous back of the central plane of the globe, except in the upper outer quadrant, where a long thin band which was apparently attached to the retina, a little anterior to the equator of the globe, projected toward the center of the vitreous chamber to a distance of five or six millimeters. The optic disc was pale, its margins, particularly at the temporal side, hazy and very slightly elevated. The vessels at the disc were much smaller than normal, some of the swollen veins and arteries having apparently disappeared entirely, the arteries at the disc presented a much reduced caliber, and some were accompanied by delicate white lines on either side, indicating a thickening of the vessel walls. After having passed the disc the caliber of the arteries appeared to increase. A decided white line could be traced along a nasal, arterial branch to the periphery, where it disappeared. The arterial branches throughout the fundus were reduced in number and in size. The veins were quite small and not engorged. No thickening of their walls could be determined. They became quite small at the disc. An irregular spot of choroiditis with disturbance of the retinal epithelium, measuring two by one disc diameters, was present at the macula. A narrow band of white tissue was seen in the lower outer quadrant of the fundus, which was apparently attached to the retina throughout one border and projected into the vitreous perhaps one millimeter. This band was about two disc diameters in length. Tension of globe, normal. No pain. Field slightly contracted concentrically. Heart action normal. V. as above. Urine normal.

Macroscopical examination of the right eye.—The exterior of the eye is normal in size and appearance, except that the cornea shows slight vascular opacification at its periphery. On section the cornea appears to be of normal extent and thickness. The

Longitudinal section of globe in the case of Lloyd H. Fibrous bands in the vitreous chamber springing from the retina.

iris is adherent to the cornea at its periphery, as in chronic glaucoma, for a distance of one millimeter, and is atrophic, but little of the ciliary body except the processes remains. Lens normal. Aside from an apparent thinning of that membrane the choroid appears normal, as does also the sclera. The vitreous chamber is almost completely filled with blood. After the greater part of the blood has been gently floated out, bands of new formed tissue are disclosed which have their origin in the retina and project into the vitreous. The retina, which is in position, is not as transparent as in the normal eye. Of the bands of connective tissue previously mentioned, one takes its origin from the retina near the optic nerve, spreads out into a broad, thin membrane, a margin of which remains attached to the retina and reaches to the equator of the globe. A second, in the form of a thin membrane, has its widest attachment a few millimeters back from the ora serrata, extends backward meridianally toward the optic nerve; its free border extends into the vitreous chamber about two millimeters. A thin membraneous fold is attached to the retina near the ora serrata and forms a loose, almost complete diaphragm just anterior to the equatorial plane of the globe. The retina at and near the optic nerve is thickened. On gross inspection the optic nerve appears normal.

Microscopical Examination.— The cornea is vascular superficially at its margin: (pannus tissue) it is otherwise normal. Sclera, normal.

Iris.— The iris angle is abolished by adhesion of the iris to the posterior surface of the cornea. Its vessels are reduced in number and in caliber: the iris is atrophic. The ciliary body is atrophic; the processes are attenuated but are not devoid of vessels.

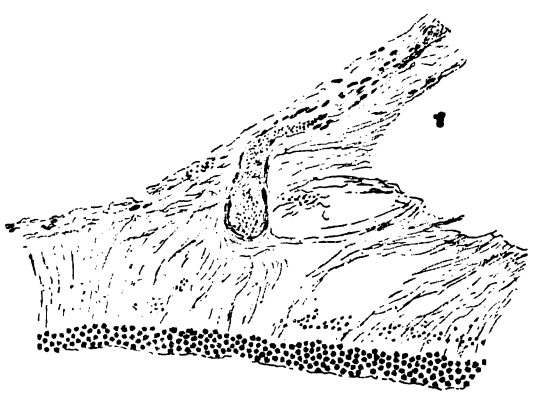
Choroid.— This membrane is greatly reduced in thickness owing to a disappearance of many of the blood vessels. The

small number of vessels that remain seem imbedded in a membrane of pigmented connective tissue. The peri-vascular spaces are abolished. Hemorrhage into the tissue of the choroid occurs in some parts. There is nothing to be seen of the chorio-capillaris. Lens normal.

Vitreous.— The anterior portion of the vitreous chamber contains remnants of vitreous and fibrin with blood corpuscles. The posterior portion was occupied by blood clot which escaped during the process of hardening. A thin layer of this clot remains adherent to the retina. Thin membraneous bands attached to and apparently originating from the retina, traverse the vitreous chamber.

Retina.— The anterior layers of the retina have taken on fibrous degenerative changes, the ganglionic cells have disappeared in large part, and the inner nuclear layer is much reduced, indicating a degenerative process resulting in a disappearance of many bipolar cells. The external layer of the retina — particularly the outer nuclear layer and the layer of rods and cones — show many spaces which are evidently due to the presence of a serous exudation. In a few places the rods and cones are shorter, and are attached to the choroid, the result of a mild plastic inflammatory process. The rods and cones are normal only in a very few places. Nearly all show marked evidence of degeneration. *Optic Nerve.*— A few millimeters back from the lamina cribrosa the optic nerve is but little changed. There is an increase in the connective tissue elements at the periphery of nerve, and there is an increase in nuclei. At and within the lamina cribrosa the infiltration of small cells is more marked, but in no place is there sufficient infiltration to give the appearance of an active inflammatory process. A connective tissue degeneration of the nerve fibres in the head of the nerve is evident. Projecting from the lower third of the optic disc and adjacent retina into the vitreous for a distance of about four millimeters is a process composed of fibers springing from the disc, which appear to be prolongations of the normal connective tissue structure of the disc and retina. This process contains a very few blood vessels. The membrana limitans interna does not appear to be present over

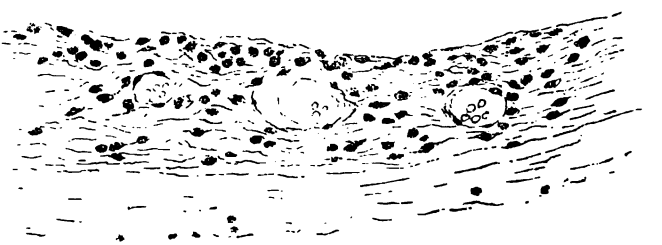
the process nor in the retina at this point. The lamina cribrosa is pushed outward, forming a relatively deep cup; this is not visible macroscopically, because the cup is more than filled by newly-developed tissue. *Blood Vessels.*— Marked change has taken place in the walls of many of the vessels. This consists in a fibrous degeneration of the walls of the arteries and veins, which is much more marked in the arteries. The change is apparent in the arteria retinæ centralis in the optic nerve back of the lamina cribrosa. The intima is not involved, the fibrous degeneration affecting the muscularis and adventitia of the vessel wall. After passing the lamina cribrosa into the nerve head, the vessel walls are so intimately associated with



Blood vessels springing from retina and entering new-formed membrane.

the surrounding connective tissue that they do not present their distinctive features. The lumen of the arteries is reduced to a much greater degree than the lumen of the veins. There is marked paucity of vessels in the nerve fibre layer of the retina, which increases toward the ora serrata. Many of the vessels are reduced to fibrous cords. There is very little infiltration of small cells. The perivascular lymph space is greatly distended, apparently with serum, along parts of some of the retinal vessels, but is entirely abolished along other parts of the vessels. The hyaline elastic intima is of normal thickness; it is bunched up and thrown into many folds, the lumen of the vessel being either obliterated or much reduced.

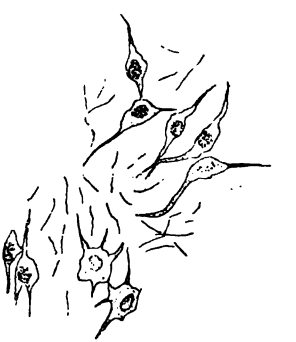
Many of the veins have disappeared, leaving scarcely a trace; others have a moderate lumen. Their walls do not show a great thickening, as do the arteries, but seem to have collapsed from lack of sufficient blood to keep them filled. Here and there, at some distance from the disc, an engorged vein is encountered. In one place a hemorrhage into the vitreous has evidently taken place from one of these engorged



New-formed membranes with blood vessels.

veins. The fibrous degeneration of arterial walls does not appear to be as great at the periphery of the retina as it is at and near the optic disc.

The new-formed membranes are, in part, composed of young connective tissue cells (leucocytes), which are found in a continuous layer of varying thickness, apparently located on the posterior aspect of a layer of fibrin. When new-formed membranes are continuous with the retina, connective tissue fibers pass directly from the nerve fiber layer into the membrane, the membrana limitans interna being interrupted at these places. These fibers may be derived from the supporting fibers of the retina, but they are very fine, and do not present the characteristics of Müller's fibers. They are not continuous throughout the membranes. At the newer parts of the membrane large round, and spindle-shaped, formative cells are present, which are apparently developing into connective tissue. In the older portions of the membranes the



Character of some of the formative cells found in the new-formed membrane.

connective tissue formation is complete. The direction of the fibres is irregularly parallel to the surface of the membrane. At the place of the attachment of the membranes to the retina, distended venous vessels are found, which project into the new-formed membrane, and small and well-filled arteries

Elongation and rupture of Müller's fibers from traction due to contraction of new-formed membranes.

are occasionally encountered. In the new-formed membranes vessels with organized walls are found in the connective tissue portion, and channels, limited by a single layer of endothelium, are found in that part of the membrane which is composed of fibrin only.

RESUMÉ OF THE LITERATURE.

Becker ("Bericht u. d. Weiner Augenklinik Wien," 1867, p. 106) records the case of a patient of 20 years, who presented himself at the clinic with an extensive dark opacity in the vitreous. When the dark mass disappeared, a white vascular new formation was visible, the vessels of the new growth anastomosing with the retinal vessels. V. = 0. Scleral staphyloma and cataract subsequently developed.

Jager's case ("Hand Atlas of Ophthalmoscopy," p. 142, Fig. 87, 1869). Male, 20 years; myope. Patient was under observation one year. One eye only was affected. The condition observed was the result of a number of attacks of partial failure of vision, each of which was, in turn, partially recovered from. St. Pr. A white or yellowish-white membrane of varying denseness surrounds the nerve, and extends upward and downward; it is made up of membraneous bands, which anastomose and form a crude network; losing themselves in the

vitreous humor, the membrane is attached to the retina in places, but projects well in the vitreous humor. There are no blood vessels on the new formation. V.=$^{4}/_{200}$.

Manz ("Graefe's Arch.," V. XXII, p. , 1876) first proposed the term retinitis proliferans for this condition. He reports three cases in his first paper, a synopsis of which follows:

Case I.—Male, æt. 15 years, came under observation September 3, 1874. Patient not well developed; no history of syphilis. Heart and kidneys normal. The vision of the left eye became impaired one year ago. No history of pain or inflammation. Six weeks ago vision of right eye became suddenly impaired. St. Pr. R. E. Iris of a greenish color. A floating body of a grayish color is observed in the vitreous chamber; this body covers the disc. No details of the fundus can be seen. V.=$^{3}/_{200}$. L. E., V.=$^{1}/_{8}$. A whitish membrane occupies the posterior portion of the vitreous chamber in the region of the disc. The membrane bears blood vessels. The patient was under observation one and a half years. Potassium and mercury were given. When last observed, the membranes were less pronounced—had shrunken. The visual fields were contracted. R. E. V.=$^{1}/_{50}$. L. E. V.=$^{1}/_{8}$.

Case II.—Male, æt. 19 years. Anæmic, left ventricle slightly enlarged; palpitation frequent. Visual fields contracted. When first seen there were some floating opacities in the vitreous humor of both eyes. Whitish membranes were present in both eyes; they were most pronounced in the vicinity of the disc, were attached to the retina, and extended well into the vitreous. These membranes bore blood vessels, part of which were evidently new formed. R. E. V.=$^{2}/_{20}$. L. E. V. =$^{3}/_{20}$. Irides of a greenish color, due to intra-ocular hemorrhage. The patient was under observation about one year, during which time mercury and potassium were given. When last seen, the membranes had become slightly reduced in size, and some of the blood vessels had disappeared from them. Pigmentation at the base of the membranes was observed. R. E. V.=$^{10}/_{20}$; field contracted at inner side. L. E. V.=$^{12}/_{20}$; field normal in extent. The irides had resumed their normal color.

Case III. — Male, æt. 52 years. Strong man. Came under observation January 27, 1876. Fifteen years ago had what was apparently a slight intra-ocular hemorrhage in the right eye, since which time a scotoma has existed in the lower part of the visual field. St. Pr. L. E. V. = 1. R. E. V. = $^{20}/_{70}$. There is a white membrane in the fundus of the right eye at the optic disc, which projects into the vitreous humor 2.5 mm. The membrane was supplied with arteries and veins, which were plainly continuous with the retinal vessels. Many of the vessels of the membrane and some of those in the retina were accompanied by white lines (perivasculitis). Some thin white bands projected far into the vitreous, and some small white patches were observed in the retina that were not connected with bands that projected into the vitreous humor Under treatment with potassium and mercury, the vision improved slightly, and the membrane became less dense. Some of the vessels on the membrane disappeared; others were partly obliterated. An irido choroiditis developed, which reduced vision to perception of light. It subsequently increased to $^{2}/_{200}$.

Manz ("Arch. f. Augenheilk," Vol. XXVI, 2, p. 55) was the first to describe the microscopical appearance of an eye destroyed by retinitis proliferans. The patient, whom he first observed in September, 1874, came under observation again in 1879; his vision had been entirely lost, and he was an inmate of a blind asylum. The condition then was: R. E.— White cataract; complete post. synechia; globe shrunken; vision nil. L. E.=Cortex of lens opaque; perception of light; probable detachment of retina. Patient complained of severe pain in the right eye, and it was enucleated June 23, 1879. On equatorial section of the globe, after hardening in Müller's fluid, a dark fluid escaped from the space between choroid and retina, which was filled with cholesterine crystals. A funnel-shaped detachment of the retina was present on microscopical examination. The connective tissue elements in the nerve fibre layer of the retina were increased. No change was noted in the walls of the blood vessels; Müller's fibres were apparently hypertrophied and elongated. A delicate new-formed membrane was observed lying on the inner surface of the retina.

A development of endothelial cells was described, which Manz believes originated in the vitreous humor. Optic nerve atrophic; the iris was adherent to the cornea at its root (evidence of glaucoma at some period). On account of the great changes in the globe, the microscopical examination was not satisfactory.

Manz ("Zehenders Klin. Monatsbl.," 1890, p. 63) reports two more cases:

Case IV. — Male, æt. 23 years. Patient never ill. No syphilis. The vision of the left eye was suddenly lost. The patient was seen by a surgeon, who diagnosed recurring hemorrhages into the vitreous humor, and noted some small retinal hemorrhages in the right eye. Heart action increased. One year later the patient was seen by Manz. St. Pr. Pulse, 96. No organic heart lesion. Urine normal. R. E. V. $= {}^{5}/_{4}$. Fundus and tension normal. L. E. V. $= {}^{4}/_{200}$. Ophthalmoscopic examination disclosed the presence of a connective tissue membrane, which occupied the vicinity of the disc, and extended into the vitreous humor 3.5 mm. Large and small new-formed vessels were present on the membrane. It was pigmented in parts. No retinal detachment. The patient was treated with potassium and mercury. No change in the condition of the eyes. Heart action dropped to normal.

Case V. — Female, æt. 20 years. Always well. Had frequent nose bleed before menstruation was established. Two weeks before coming under observation the vision failed suddenly. Menstrual flow eight days later.

St. Pr. Pulse, 108. No organic lesion. Thyroid gland slightly enlarged. Urine normal. R. E. V. $= {}^{5}/_{9}$. L. E. V. $= {}^{5}/_{6}$. Tension and limit of visual fields normal. Examination of Fundus — Arteries small, veins over-full. Numerous small hemorrhages in retinæ. Hemorrhages occurred at each menstrual period. After three or four menstrual periods the left eye ceased to be affected, but the right eye suffered repeatedly. Potassium in small doses was given, and continued for seven months. At the end of fourteen months the condition was as follows: L. E. V. $= {}^{5}/_{5}$. A few small vitreous opacities. Arteries small. One of the superior veins was bordered with white lines extending to the periphery. R. E. V. $= {}^{5}/_{18}$. A

thin white membrane lies in the vitreous humor oves the retina in the vicinity of the disc. It is attached to the retina, and bears a few new-formed blood vessels. Vessels of retina, apparently normal. The case was under observation twenty-six months. The pulse fell to 80.

Leber ("Graefe Saemisch," B. V, p. 665) mentions having observed two cases, one occurring in a male, one in a female. In both cases the hemorrhage was from the periphery of the retina, and was recurrent. Pigment was observed at the base of the membrane. Hemorrhages from the blood vessels on the new-formed membranes was observed.

Goldzeiher ("Klin. Monatsbl. f. Augenheil," Vol. XVII, p. 45) describes a globe which he examined, which presented a spongy, white, new formation in the vitreous. The growth presented numerous hyaline bands and trabeculæ in the vitreous chamber, which appeared to take their origin from the membrana limitans interna, and were regarded as extensions from Müller's fibres. Few, if any, blood vessels were present in the new tissue.

Strawbridge (Trans. Amer. Oph. Soc., Vol. ii, p. 304, 1880), under the heading of connective tissue in the vitreous humor, describes a case. Three years ago the vision of the right eye was obscured as though a veil had dropped over the pupil. The obstruction soon passed away. The following year similar symptoms occurred in both eyes, followed by marked improvement, but not entire recovery. There has been a gradual failure of vision of both eyes since. No pain. No photophobia. R. E. V. = 4/200. Field contracted inward and outward. L. E. V. = 10/200. Field contracted upward and outward. A very excellent plate accompanies the article, a partial description of which follows: The growth starting at the optic disc, which it surrounds, projects upward, downward, and inward. The upper part divided into three roots, which disappear in the vitreous humor. The lower division spreads out fan-shaped, extending along the course of the descending vessels, it becomes delicate and feathery, and is lost in the vitreous humor. The inner division commencing at the papilla rapidly widens into a broad wide-stretching membrane traversed by numerous blood vessels

and projecting well forward into the vitreous humor, so much so that by oblique illumination it is plainly visible. This formation appears thick and of opaque white color, but in other places it is delicate and attenuated. Between the different portions of the growth and in the periphery the fundus is of normal color and appearance. The retinal veins are tortuous and over-full. Remarks the similarity to Jäger's case.

Nieden (Trans. Oph. Soc. Heidelberg, 1882, p. 8), mentions having observed six cases of hemorrhage into the vitreous occurring in young men in 34,489 eye patients. In one case after the absorption of a mild hemorrhage from one of the lower papillary arteries, a severe hemorrhage from the periphery followed. Absorption progressed very slowly. It terminated in the development of a firm vascular connective tissue membrane. The vessels on the membrane were in direct connection with the affected artery before mentioned.

Van der Loan (Period. de Oph. prat. 5 u 6), in five cases of retinitis proliferans found syphilis to be the cause in two of the cases.

Probsting (Zehender's Klin. Monatsbl., 1890, p. 73), reports a case occurring in a male patient æt. 44 years. Dimness of vision affecting both eyes has been noticed for one year. Six months ago the dimness of vision suddenly increased. There was a history of a blow on the right eye received in early youth which might have produced intra-ocular hemorrhage. St. Pr. The patient is suffering from albuminuria and presents a picture of albuminuric retinitis in both eyes. On ophthalmoscopic examination of the right eye, a whitish membrane was observed which was crater-shaped and covered the optic disc. Parts of this membrane extended above and inward, and above and outward, disappearing in the vitreous humor. No mention is made of blood vessels on the membrane. No history of syphilis. The membrane has evidently long preceded the albuminuric retinitis.

Gunn (Festschrift von Helmholtz, 1891, p. 6), describes a case of hemorrhagic disease of the retina in which one or two of the larger veins were greatly narrowed, midway in their course, while the terminal branches were engorged and tor-

tuous; hemorrhages had occurred in relation to these veins. At the upper temporal part of the fundus a large irregular silvery patch was observed, with tortuous veins passing over it. He thinks that the hemorrhages were due to interference with return of venous blood, because of the constricted veins.

Banholzer (Arch. f. Augenheilk., V. xxv, p. 186). Female, æt. 39 years, was struck on the left eye, September 27, 1890. Admitted to the clinic, October 3, 1890. St. Pr. Chemosis and ecchymosis of ocular conjunctiva below. Cornea elliptical, folded and opaque in lower half. Hyphæma. Interior not visible. Perception and projection good. October 14, blood absorbed. Iridodialysis at nasal border. February, 1891, eye painful. Scar in sclerotic at point of rupture, ectatic. Light ring of connective tissue about the disc. May 21, 1891, pain in the eye continues. At the nasal side concentric to the corneal border, the site of the scleral rupture is apparent. Pupil and coloboma filled by thin membrane. Vitreous hazy. The optic disc was surrounded by a white band from which a band extended to the equator of the globe below. The retinal vessels pass under this band except near the papilla where one large vessel curves over it. Enucleation. After hardening in bichloride and alcohol, the globe was divided horizontally. The lens is wanting. In the vitreous chamber a short distance behind the iris is a yellowish white mass which is connected with the bands in or on the retina by a few fine fibers. From one of the bands in the retina a delicate membrane stretches through the vitreous.

Microscopical Examination. — From the raised portions of the retina numerous bands pass to the cyclitic membrane, the disturbance of the retina evidently being due to traction from these bands. There is a marked proliferation of the inner parts of Müller's fibers and splitting of their ends. The membrana limitans is drawn far from the inner reticular layer but is preserved. Dense connective tissue tracts composed partly of elongated supporting fibers and partly of connective tissue fibers, run longitudinally in the nerve-fiber layer of the retina. Near the apices of the elevations, the net-work becomes looser. Near the disc the retina is folded. The author considers the

case one of true retinitis proliferans. (Drawings of macroscopical and microscopical appearances accompany the article.)

Schultze (Arch. f. Augenheilk., V. xxv, p. 298), reports two cases. First, male, æt. 29 years, first observed July 6, 1870. After an attack of fever the vision was suddenly lost. When seen the vision of the right eye was 6/200; left eye 8/200. Globes normal in appearance. Grayish green exudation in retina near the disc. Vitreous cloudy in vicinity of disc. July 19th, vitreous traversed by fine threads. Molecular opacities. Potassium given. September, 1871, under treatment with mercury and potassium the vision slightly improved. August 29, 1890, patient strong and well. No history of syphilis. R. E. V. = 5/6, extent of field normal. Vitreous contains many floating opacities. The temporal half of the disc is concealed by a connective tissue formation, which spreads out in a triangular form over the surrounding retina, it projects into the vitreous about two mm. The white membrane bears a few blood vessels. Some pigment is observed near the end of the inferior strand. L. E. V. = 1/12. There are numerous floating opacities in the vitreous. Retinal arteries small. Disc pale. There are two small white patches in the retina.

Second case, male, æt. 25 years. Vision good until the winter of 1888; first failed in the left eye and later in the right eye. On May 20, 1889, the diagnosis of diffuse opacities of the vitreous was made. The patient was treated with potassium and iron. On January 10, 1889, the vision equaled perception of light. October 18, 1891, since the last observation the patient has had several relapses. Has suffered some from epistaxis. St. Pr., R. E. V. = 1/100. A white membrane covers the disc, the membrane is irregularly star-shaped and is about ten discs diameters in its largest extent. At its center, which is open, a few processes extend into the retina. No blood vessels can be seen on the membrane; near its margin two small apparently fresh hemorrhages are observed. L. E. V. = 6/25. Disc congested, retinal veins large and tortuous. A few white striated patches are found at the periphery in the retina. (Illustrations accompany the article.)

Axenfeld (Arch. f. Ophthal., V. xxiii, p. 119). Female, æt.

33 years, healthy. In 1889 right eye became inflamed and vision to the left and front was impaired. The right eye remained well after the inflammation until November, 1891, when a dense cloud appeared in the center of the field of vision. The vision improved, but on December 25th, a fresh mist appeared. Vision again improved, but in March, 1892, the "darkness" increased, and has remained. Patient is quite blind at twilight. Left eye, media clear, except in nasal part of vitreous humor. Optic disc red. "The outer margin is covered by a white, spherical, partly pigmented mass, which projects 0.5 mm. above the plane of the retina and in part rests on the nerve." Several new-formed vessels can be seen on this nodule. On the inner side of the disc, opposite the nodule, begins a narrow strip of atrophic choroid with hilly pigmentation. It runs inward and downward to the periphery. It is one and one-half disc diameters at its widest part. Under the atrophic choroidal ridge, a short distance from the nerve, a large retinal artery and its vein emerge. These vessels take the same direction as the chorio-retinal scar. The retina containing the two vessels soon becomes raised in the form of a very narrow, steep, grayish-green, radial fold, which becomes narrower and more raised until the crest with its two vessels becomes detached, and extends, as a thin linear strand, free into the vitreous humor. During their course through the vitreous, the vessels and band are partly covered by a white shining membrane with which they are connected. The vessels end in a large tendinous mass, which at the periphery appears to be connected with the retina by numerous cobweb-like filaments. The mass at the periphery projects about 3 mm. into the vitreous chamber. V.=6/10, right eye. Numerous floating opacities in the vitreous. Large detachment of the retina below and at the sides. In the lower part of the vitreous and attached to the detached retinal folds are bands of connective tissue, bearing large new-formed blood vessels. A few fresh hemorrhages were observed. A shining greenish-white mass projects from below and extending above the disc juts out free into the vitreous. There are extensive atrophic patches in the choroid, V=16/200. Treatment with the iodide of potash extending over six weeks produced no change.

Simon (Centralbl. f. Augenheil., Nov., 1896, p. 321). Male, æt. 27 years, healthy, no syphilis. Was first seen August 13, 1893. Saw well with the right eye up to six months ago. On August 12th, patient became suddenly blind, preceded by severe epistaxis. Examination disclosed extensive haziness of the vitreous. In the vitreous a large oval, elevated, connective tissue, new formation, of a bluish-gray color, was seen bearing thin-walled, new-formed blood vessels. On and near it were fresh hemorrhages. V. = 5/200. Left eye normal, V.=6/4. October 7, 1893, V., R. E.=6/8. A superior retinal vein which passed to the connective tissue formation showed white lines on each side, perivasculitis. From the new-formed membrane fine connective tissue processes extend into the vitreous. In the lower part of the fundus is a thick band of connective tissue partly covered by blood. During the progress of the case nearly all the veins showed the white lines at their margins. From time to time round or elongated grayish-blue clouds appeared along the veins which completely or partly covered them; not, however, appearing to be as dense as the strips along the margins of the veins. The bluish spots were undoubtedly masses of exudation. After days or weeks these disappeared, only to reappear, and were usually forerunners of small hemorrhages. Severe hemorrhages occurred six times. As the hemorrhages were absorbed, they were found to be on the connective tissue bands, never on the retina. The new formation grew smaller and smaller. The blood vessels disappeared, and on October 7, 1894, none could be seen. The upper dense ring became detached from the retina and floated in the vitreous. The lower dense mass remained. The white lines along the veins disappeared in great part, V.=6/5. The left eye remained free until February 12, 1894, when white lines were observed along a temporal vein, and a month later a very small exudation was observed well to the temporal side. The process progressed until on July 20, 1894, almost all the veins were bordered by white lines, and numerous hemorrhages and exudations were observed. These conditions disappeared in greater part, and on September 16th, there was little left.

Zimmermann (Arch. of Oph., V. xxvi, No. 1, p. 51), reports a

case of retinitis proliferans following injury. Male, æt. 37 years, fell while boarding a car and struck on the right side of his face, fracturing the nasal bones. December 21st, vertical wound in lateral part of ocular conjunctiva. Paralysis of motor oculi nerve. Retinal hemorrhages, V.=0. Diagnosis: Laceration of optic nerve and vessels immediately back of globe. December 30th, the visible vessels are veins which are thickened and divided into dark red sections. Hemorrhages about veins, milky haziness about disc. January 22d, formation of connective tissue commences. October 3d, white connective tissue bands, having an alveolar structure, begin at the optic disc and extend to the nasal portion of the retina. New-formed blood vessels appear upon it. Some spots of pigment are observed on it. There is some whitish new-formed tissue at the macula and two hemorrhagic patches. "The lower temporal portion of the fundus presents an extensive formation of connective tissue." November 7th, the formation of connective tissue is more extensive. The disc is covered. New-formed vessels and remnants of hemorrhages are found on it. (Illustrations of the fundus accompany the article.)

It appears from a study of the cases observed and reported, that the essential in retinitis proliferans is the production of membranes or processes which extend from the retina into the vitreous humor. The histories of the cases recorded show that such membranes may be produced in three ways. First, by a pathological condition for which no cause has been assigned, which we may term idiopathic retinitis proliferans. Second, a similar condition due to a low form of syphilitic retinitis — syphilitic retinitis proliferans; and third, a form following traumatism with rupture of the retina and choroid, and in some cases, of the sclerotic, or disturbance of the circulation due to division of the optic nerve just behind the globe (see Zimmermann's case), traumatic retinitis proliferans.

A study of the reported cases compels one to believe that a fibrinous exudation or hemorrhage into the vitreous must first occur before the new membranes can be formed. In all but one of twenty-two cases in which I have had opportunity to consult the original, a history of exudation or hemorrhage is given. I

have not seen the original of the five cases reported by Van der Loan. In the opinion of the writer, it is necessary to form a coagulum in the vitreous, either of fibrin alone or of fibrin and blood corpuscles, before the membrane can be produced. The new membranes are beyond doubt continuous with the nerve fiber layer of the retina, many of the new fibers extending from this layer into the vitreous; it is also true that the cells composing the membrane in its newer parts are made up of formative cells, such as one sees in granulation or new cicatricial tissue. The fibers extending from the anterior layer of the retina do not bear a close resemblance to Müller's fibers, and although many of them may be extenuations of and from Müller's fibers, as held by Manz, Goldzieher, and Banholzer, in all probability many are derived from formative cells, originating as do those which produce cyclitic and kindred membranes.

The occurrence of blood vessels on the membranes is noted in eighteen of the twenty-two cases whose full histories I have consulted, of these fourteen were in idiopathic cases, three in traumatic cases, and one in a syphilitic case. In the idiopathic and syphilitic cases it was noted that the vessels sprang from or were in direct communication with retinal vessels, and in one or two of the traumatic cases it is probable that the vessels on the membranes took their origin from the retina, although rupture of the choroid must have occurred in two of the traumatic cases. In all of the cases of idiopathic and syphilitic retinitis proliferans, with one exception (Jäger's), both eyes were involved, showing that the determining cause was not local. In the traumatic cases only the injured eye was the seat of the change. In the greater number of cases the patients were otherwise healthy, with no history of acquired or inherited syphilis. Some of the patients were reported as being anæmic, one had albuminuric retinitis; nose bleed had been of frequent occurrence in a minority of the cases. On the whole no condition of the system was sufficiently constant to suggest a causative relation.

The ages of the patients ranged from eight to fifty-two years, eighteen of the twenty-seven patients being between the ages of fifteen and twenty years.

The sex in twenty-two cases, where it was given, was male, seventeen; female, five.

In many of the cases the field of vision was somewhat contracted.

Results. — In almost all of the cases the vision is seriously and permanently impaired. In some cases, Becker, Manz, Goldzieher, and the author, vision were totally destroyed. Tension is not increased, except in the later stages of some of the more severe cases, when the eye may become painful and require enucleation. In traumatic and in syphilitic retinitis proliferans the prognosis is quite good, but there is much danger of retinal detachment from traction on the part of the connective tissue bands. Treatment is of little avail, except in syphilitic cases, in which the progress of the affection may be checked; as Leber writes, the general course is to loss of vision.

It is quite evident that the condition determining the production of exudation, hemorrhage, and subsequent membranes in the vitreous humor, is, as Leber has suggested, an interference with the circulation, primarily retinal. In idiopathic retinitis proliferans, a fibrous degeneration and proliferation affects the inner layers of the retina and the walls of the arteries, principally. The choroid also undergoes a somewhat similar change. In syphilitic retinitis proliferans, a round cell infiltration of vessel walls and perivascular sheaths; in traumatic retinitis proliferans, an interference with the arterial flow (Zimmermann's case). Manz is of the opinion that the deeper parts of the retina and the choroid are often involved, and believes that the hemorrhages may come from the choroid in some cases. The former is undoubtedly true, but it is difficult to see how the hemorrhage in idiopathic cases can emanate from any other membrane but the retina, originally. Later there can be no doubt that the hemorrhages often take place from the newformed thin-walled blood vessels of the membranes.

A CASE OF RETINITIS CIRCINATA.

BY DR. EDWARD FRIDENBERG,

NEW YORK CITY.

The diagnosis of albuminuric retinitis cannot be positively made from fundus changes alone. Not only has the stellate figure at the macular been occasionally seen in retinitis from various causes, but the apparently typical picture of nephritic retinitis, with white plaques, hemorrhages, swelling of the disc, etc., may be produced by intracranial lesions. Besides these cases in which the most experienced ophthalmoscopist would confess his inability to distinguish the picture presented by the ocular fundus from that pathognomonic of Bright's disease, we meet not so rarely changes in the background of the eye resembling more or less closely, though hardly simulating the albuminuric variety, changes which might mislead the less practiced oculist. Such are the cases described by Fuchs under the name of Circinate Retinitis, by de Wecker as Fatty Degeneration of the Retina. Suspected kidney disease, furthermore, is not always easily proven or excluded. Albumen may be absent for weeks to be only found in minute quantities. Functional albuminuria might possibly be found in a case of retinitis without organic kidney disease, as these cases usually occur in aged individuals.

If we now consider the different prognosis in these two classes of cases, the nephritic variety, involving the strongest probability of a fatal termination within three years, a rapid diminution of sight in most patients and, with a very few exceptions, in both eyes, the circinate variety being compatible with long life and a moderate degree of amblyopia, quite frequently on one side only, the consequences of an erroneous diagnosis both for physician and patient are self-evident.

As little is to be found in American literature on the subject, the importance of chronicling all such cases in the hope of accumulating sufficient material for further subdivision and classification seems to furnish a valid excuse for presenting to you a case of Circinate Retinitis.

T. F., an Irishman, retired, aged 70, was first seen by me on December 11, 1896. He is moderately intelligent, well preserved, and apparently in good health. His sole complaint is that for several years his eyes have "been growing bad for reading."

Examination of eyes shows:

O. D. 20/100 −; +1.75 Dsph. 20/100 + Diffuse opacity of the lens, especially of the nucleus. No stripes. The optic disc can be made out and gross changes of the fundus excluded.

O. S. Fingers at 14¹. Cornea, ant. chamber, and iris normal. Lens very slightly smoky. Vitreous clear. The fundus presents appearances which are very accurately and skillfully reproduced in this water-color, made for me by my brother, Dr. Percy Fridenberg of New York, about March 15, 1896. These I shall describe further on.

The patient now being questioned claimed that he had "never been sick in all his life." He especially denied syphilis, rheumatism, or gout.

Examination of heart and lungs and of the abdominal viscera absolutely negative in its results. Radial and carotid arteries present no marked evidence of atheroma. Urine Sp. Gr. 1015. No albumen. No casts. The patient has been under observation up to the present time. The urine has been repeatedly and thoroughly examined by myself and by Dr. Henry Heiman, a very competent pathologist. The specific gravity varied from 1015 to 1022, but the urine was normal at all times, no albumen or casts being discoverable. Vision has remained about stationary, varying between 14/200 and 10/200; color perception was normal. The visual field taken on February 9th shows slight general contraction with a marked contraction in upper temporal quadrant. No scotoma either for white or colors.

Ophthalmoscopic picture.

The details of the fundus can be seen distinctly; its reflex is rather light red. The disk shows faint pinkish discoloration, due to increased capillary supply. The retinal arteries are very slightly blurred, but of normal calibre. Near their terminations the retinal veins, previously normal, become markedly tortuous and varicose, and at one or two points show small punctate hem-

PERCY FRIDENBERG, DEL '97

RETINITIS CIRCINATA

FRIDENBERG

orrhages. In the retina along the temporal border of the disk and quite close to and concentric with it, there is a collection of hemorrhagic spots in approximately crescentic arrangement. These spots appear most intensely colored, where small venous twigs pass over them, the latter being varicose at these points. Just above and to the temporal side of the papilla a conglomeration of tortuous or varicose retinal veins is noticed. The retina here is slightly cloudy and appears to be slightly suffused with blood, but there is no distinct extravasation. The region surrounding the macula is the seat of marked and peculiar changes, such as originally suggested the name of circinate retinitis. They consist in a wreath of sharply defined, slightly raised, faintly lustrous, milk-white spots of varying forms. Their outlines may best be characterized by likening them to small clots seen in curdled milk; a few are simply punctate; others have an irregular leaf-like shape. The entire figure around the macula is an incomplete recumbent ellipse, the lower, inner fifth of which is wanting. Here, however, two blood patches are seen, which appear to be a direct continuation of the lower curve. The figure is about 4 O. D. long and 3½ O. D. high. The upper macular vein runs across the upper margin of the ellipse and is distinctly seen on a white spot, its outline not at all obscured. An upper branch of the lower macular vein runs into the ellipse. Within the ellipse are three hemorrhages, close to the above-mentioned venous branch. One of them, the furthest from the O. D., is annular in form, and allows the apparently unchanged retina to show at its centre. With the exception of one or two small white dots the macular itself is free. A very striking appearance is presented by a large solid insular plaque situated on a line with the macula, about as far to its temporal side as the macula is from the disk itself. It shows the same creamy color as the circummacular wreath. It is slightly raised, nearly circular, about 4 O. D. in diameter. The outline shows a very peculiar succession of small rounded protrusions and recesses. Some of these are again lobulated, by budding processes, as it were. The whole appearance forcibly suggests that the plaque has been formed by coalition of a large number of irregular nodules like those around

the macula. From the upper border of the plaque an irregular collection of small scattered white masses is seen to run upwards in two diverging lines. About the plaque tortuous veins are seen, whose terminal branches ramify upon its surface, again distinct and unobscured; nowhere, however, projecting into the vitreous. These terminal branches are extremely fine, tortuous, or varicose, and form in every case an intricate plexus, or, better, leash of vessels as the ends of these apparently new-formed veinlets nowhere coalesce. At about the center of the plaque two such plexuses of minute vessels coming from opposite sides, one from the upper temporal, the other from the lower nasal, are merged in a large oval hemorrhagic patch about half the diameter of the disk. The long axis of this oval is in a line with the two venous branches. Its color is brownish red at the circumference; bright scarlet at the center. Below the temporal to it there is another smaller dark brown blood spot of a circular form. There are no other hemorrhages on the plaque, but wherever a plexus of vessels is seen upon it the creamy color is of a pinkish tinge, as if by imbibition. The vessels as they pass from the retina to the patch are seen to rise up and curve over its border. In no instance is a vessel obscured by the white patches. Even the smallest filaments may be traced over or between them. The entire absence of marginal pigment is also noteworthy.

This completes the description of the ophthalmoscopic appearances. No marked changes were noticed in the four months during which the patient was under observation. A few small hemorrhages appeared, others disappeared, but did not seem to leave white spots in their place.

The case, then, tallies in all important respects with those described by Fuchs. It presents, in addition, a feature which I am inclined to believe is unique, viz.: new formation of blood vessels in the retina. This, to my knowledge, has not yet been described. In view of the considerable number of publications of cases of newly formed vessels in the vitreous this condition, if observed, would surely not have been overlooked and would probably have been published.

To enter into the differential diagnosis between circinate

retinitis, on the one hand, and albuminuric, diabetic retinitis, colloid degeneration of the lamina vitrea and ritinis punctata albescens seems unnecessary. The pathology has been extensively discussed by Fuchs, Dr. Wecker, and others, but must remain a matter of conjecture until an opportunity for actual microscopical examination of an affected retina presents itself.

In view of the small number of cases available a discussion of the etiology also would seem to be futile.

COMPLETION OF THE HISTORY OF "A CASE OF TUMOR OF THE INTERVAGINAL SPACE OF THE OPTIC NERVE-SHEATH," REPORTED IN THESE TRANSACTIONS FOR 1894.

BY SWAN M. BURNETT, M.D.,

WASHINGTON, D. C.

The report of this case was made a year after the operation, which was done in July, 1893. At that time there was no return of the tumor in the orbit nor any symptoms of a general infection. The opinion was then expressed that the tumor was not malignant. The subsequent history of the case, however, makes it probable that the growth was not as benign as was believed or that there was an independent development of a like character in other parts of the body.

In August, 1895, the patient showed some unusual symptoms, and Dr. J. W. McSherry, the family physician, was called, and to him I am indebted for the further history, since I did not see the patient again myself. Under date of February 7, 1896, he writes: "After the removal of his eye and return home he got along fairly well, except every few days he had a slight chill, followed by a nervous spell. This condition kept up until the latter part of last August (1895), when I called his mother's attention to the protruding of the remaining (right) eyeball. In September he was taken with nausea, chills, and general debility. The protru-

sion of the eye had increased and vision was now lost. On the 15th there was a paralysis of the right arm and leg. The muscles of the neck were also involved, making it impossible for him to hold up his head. The heart and other organs seemed to be normal."

He gradually failed, and died on the 16th of March, 1896. The right eye, at the time of death, was about as exophthalmic as the left was at the time of its removal. There was no return of the disease in the left orbit. Unfortunately, no autopsy was allowed.

A CASE OF TOXIC AMBLYOPIA, WITH AUTOPSY AND MICROSCOPICAL EXAMINATION OF THE SPECIMENS.

BY G. E. DE SCHWEINITZ, A.M., M.D.,
OF PHILADELPHIA.

Although Von Graefe, Leber, and Forster surmised that central scotoma was, under certain circumstances, a symptom of lesion of the optic nerve, absolute proof of this belief was not reached until 1880, when Samelsohn published his researches on the pathological anatomy of retrobulbar neuritis (central amblyopia). True, some earlier observations (Erisman in 1867 and Leber in 1869) are on record, but as Uhthoff has observed, their cases were not pure examples of intoxication-amblyopia, and, therefore, Samelsohn has the credit of publishing the first well-studied case of this affection which came to autopsy. Since the date of this paper, the literature has been enriched by about twenty additional post-mortem and microscopical examinations of intoxication-amblyopias; but even now, there is not perfect accord with reference to the exact pathological anatomy of this interesting affection, and hence no excuse seems necessary for the record of a new case.[1] It is as follows:

---

[1] In the following list are the references to the most important papers describing the lesions in intoxication-amblyopias based upon microscopical examination:

1. Samelsohn: Graefe's Archiv, 1882, XXVIII, Abth. I, pp. 1-110.

Matthew Todd, aged 60, born in Ireland, widower, a messenger in the Philadelphia Hospital, consulted me first in the spring of 1895, with the hope of obtaining relief for failing vision.

History. — With the exception of frequent attcacks of facial neuralgia, the patient had been for many years a reasonably healthy man. He had been an inmate of the hospital for thirteen years, during the last nine of which he had been employed as a messenger in the training school. According to the rules of the institution, once in two months he was given leave of absence lasting twenty-four hours. He always returned on time, and although it is probable he was not an abstainer during these holiday hours, he was never known to be intoxicated. While within the walls of the hospital, it was not possible for him to obtain liquor. Previous to his entrance into the hospital, he kept a saloon, and no doubt drank liquor, but there is no history of alcoholic excesses. For a number of years he had smoked immoderately, indeed, he was seldom without a pipe in his mouth. He drank tea freely. There was no history of venereal disease and no signs of its influence. For a year before his death there was distinct evidence of physical failure. He suffered much from headache, and the urine was known to contain albumin. The vision of each eye had been poor for some months before he re-

2. Vossius: Ibid., XXVIII, Abth. III, p. 201.

3. Nettleship and Edmunds: Trans. Ophth. Soc. of the U. K., 1881, I, p. 124.

4. Bunge: Ueber die Gesichtsfeld und Faserverlauf im Optischen Leitungs-Apparat. Halle, 1884.

5. Thomsen: Archiv. f. Psychiatrie, XIII, p. 352.

6. Uhthoff: Graefe's Archiv, 1886, XXXII, Abth. IV, 95-108, and Ibid., XXXIII, I, pp. 257-318.

7. Wildbrand: Bericht uber die Versammlung der Ophthalmolog. Gesellschaft, XXII, Heidelberg, 1892, p. 84.

8. Sachs: Archives of Ophthalmology, 1889, XVIII, No. 2, pp. 133-162, and Ibid., 1894, XXIII, No. 4, pp. 226-444.

9. Stöltzing: Klinische und Anatomische Beiträge zur Intoxications-Amblyopie, Inaug. Dissert., Marburg, 1893. This thesis contains abstracts of all microscopical examinations in cases of toxic amblyopia up to the date of its publication.

10. Nuel: Archives d'Ophtalmologie, October, 1895; March and August, 1896.

11. Schmidt-Rimpler: Bericht uber die Versammlung der Ophthalmolog. Gesellschaft, XXV, Heidelberg, 1897, p. 99.

In addition to the cases referred to above, fifteen in number, there have been about six others, notably those of Leber, Erisman, Magnan, and Bödecker. Schmidt-Rimpler's paper describes especially diabetic amblyopia.

ported for treatment, and he was driven to seek advice because of his inability to read the newspaper.

Examination. — The patient was a tall, well-preserved, and at that time apparently healthy man. His radial and temporal arteries were rather hard and the pulse showed high tension. The urine was not examined on this date, but subsequently, *i. e.*, about eighteen months later, it was found to contain albumin and casts. Sugar was not present.

Eyes.—V. of R. E. equalled 5/60, and was unimproved by a glass. The ophthalmoscope revealed H of 2 D, a vertically oval, rather pallid disc, the temporal side being paler than the general surface. The vessels were of normal size; there were no retinal or choroidal lesions. The nucleus of the crystalline lens was hazy. The peripheral form field was normal, but there was a central scotoma for red and green. The pupil reactions were normal.

V. of L. E. equalled 5/40, unimproved by a glass, and ophthalmoscopically the same conditions were present as those on the right side. The form field was normal and there was a central color scotoma, somewhat smaller than on the right side. The lens was hazy; the pupil normal.

The patient was advised to discontinue the use of tobacco and was ordered strychnia. It is probable that he tried to follow this advice, but with indifferent success, and practically he did not stop the use of tobacco until his final illness. His eyes were examined from time to time, and the conditions already described remained unaltered.

The fields of vision in the early fall of 1896 are represented in the accompanying diagrams, viz.: O. D. A normal form field, contracted blue and red fields, loss of the perception of green, and a large central scotoma, extending somewhat beyond the limits usually seen in the earlier stages of intoxication-amblyopia, and probably reaching the limit of the red field above. O. S. A normal form field, moderate contraction of the blue and red fields, green blindness, and a typical central scotoma, 20 degrees outward, 7 degrees upward, 6 degrees downward, and about 5 degrees inward. (Figs. 1 and 2.)

On the seventh of December, 1896, the patient was taken

suddenly ill, and rapidly developed pneumonia, with uraemic symptoms. The urine contained albumin and granular and hyaline casts. Stupor supervened and death occurred on the third day.

The autopsy was made sixteen hours after death. Permission to open the skull-cap only was obtained, and the posterior halves of the eyes, together with the optic nerves, chiasms and tracts were removed and placed in Muller's fluid. With the exception of oedema of the pia-arachnoid, there were no abnormalities of the brain or cerebellum. After six weeks' hardening in frequently-changed Muller's fluid, kept at a temperature between

FIG. 1.

Left

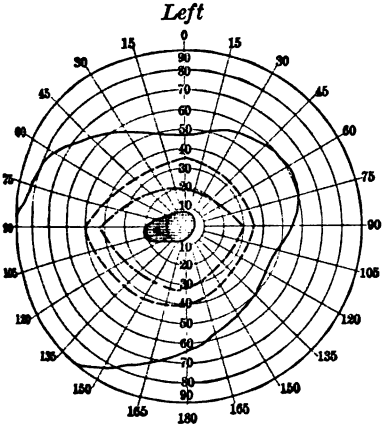
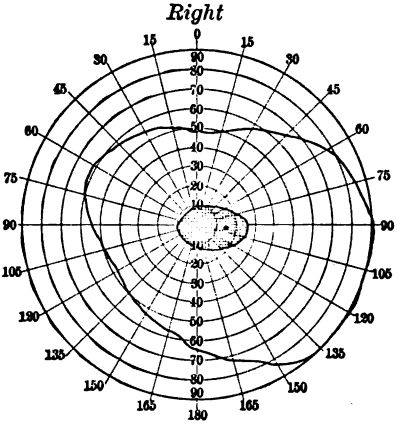


FIG. 2.

Right



The continuous line indicates the limits of the form fields; the broken lines the color fields, — — — blue; —.—.— red; the central cross-hatching the scotomas. There was green blindness. It was difficult to ascertain the limits of the color fields in the right eye; they are, therefore, not represented. The exact limits of the scotoma were also difficult to determine; they probably reached the boundary of the red field above.

The test-objects were white and colored circles, one cm. in diameter. The scotomas were determined with ¼ cm. square colored tests.

sixty and seventy degrees F., serial sections of the optic nerves, chiasms, and tracts were cut and stained according to the Weigert and Weigert-Pal methods. Longitudinal sections of the posterior halves of the eyeballs were similarly cut and stained. For the study of the histological details the carmine method was employed. For the preparation of these sections, I am greatly indebted to Dr. J. Dutton Steele.

1. *Longitudinal Section of the Posterior Half of the Right Bulbus and Five Millimetres of the Optic Nerve.* The degenerated area occupies strictly the temporal half of the nerve and passes to the pial sheath. Close to the lamina the degeneration is complete; further onward there are traces of normal nerve fibres. (Fig. 1, Plate I.)

2. *Transverse Section of Right Nerve Eight Millimetres behind the Globe.* The degenerated patch occupies the temporal (lower and outer) portion of the nerve, forming a somewhat heart-shaped area, extending at one point to the sheath. This area is imperfectly divided by a faint line of partially preserved nerve fibres. (Fig. 2, Plate I.)

3. *Transverse Section of Nerve Thirteen Millimetres behind the Globe.* The degenerated patch, still occupying the lower and outer part of the nerve, becomes more contracted and assumes an oval or somewhat meniscus-like shape. (Fig. 3, Plate I.)

4 and 5. *Transverse Section of Nerve in the Region of the Optic Foramen.* The degenerated patch tends to leave the periphery and pass to the center, although still somewhat eccentrically placed (Fig. 4, Plate I). Further onward it is still more centrally placed, with the broader end toward the outer border. (Fig. 5, Plate I.)

6. *Transverse Section of the Nerve in the Intracranial Region.* The degenerated patch is somewhat crescentic and with the broader end toward the temporal side. It occupies a position somewhat above the center of the nerve. (Fig. 6, Plate I.)

1. *Longitudinal Section of the Posterior Half of the Left Bulbus and Eight Millimetres of the Optic Nerve.* The degenerated area again strictly occupies the temporal half of the nerve and passes to the pial sheath. Close to the lamina the degeneration is almost complete. Further toward the brain patches of retained nerve tissue are seen. If the patch is studied in its relation to the vessels, it is seen in certain sections to occupy a somewhat triangular patch, which, in cross-section at this point, would produce the well-known, wedge-shaped patch with the apex toward the vessels, which has so often been described. (Fig. 1, Plate II.)

2. *Transverse Section of the Left Nerve Ten Millimetres behind*

Plate I.

Fig. 1.

Fig. 2.

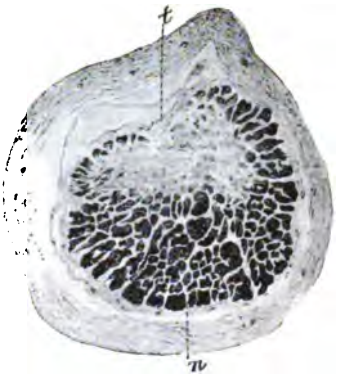


Fig. 3.

Fig. 4.

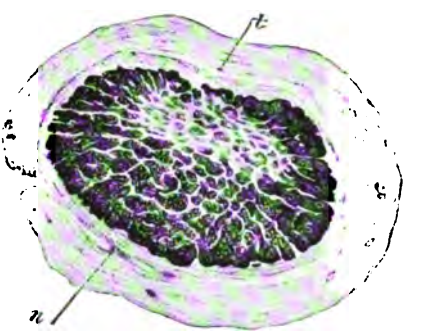


Fig. 5.

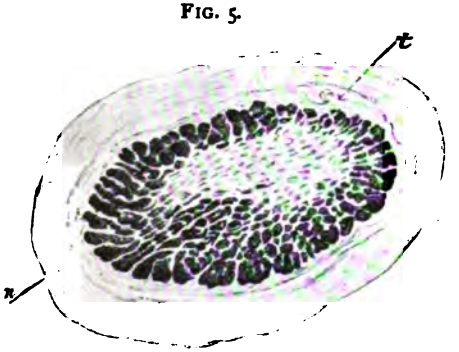
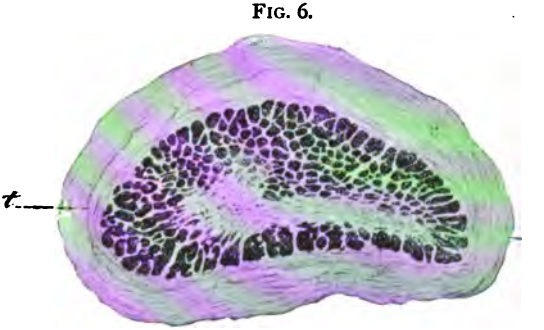


Fig. 6.



the Globe. The degenerated patch forms a crescentic or somewhat meniscus-like area with its concavity towards the vessels and reaching at its outer border quite to the pial sheath. It is divided by a distinct line of retained normal nerve fibres, the line running in the long axis of the patch. (Fig. 2, Plate II. Compare with Fig. 3, Plate I.)

3 and 4. *Transverse Sections of the Nerve in the Neighborhood of the Optic Foramen.* The degenerated patch again tends to leave the periphery and reach the center (Fig. 3, Plate II, compare with Fig. 4, Plate I), which it more nearly attains at the foramen (Fig. 4, Plate II, compare with Fig. 5, Plate I), its broadest end being toward the temporal side. The remainder of the nerve to the chiasm tallies closely with that upon the right side, as does also the appearance of the optic tract. Therefore, figures and descriptions need not be reproduced.

5. *Transverse Section of the Right Nerve Just in Advance of the Chiasm.* The section is somewhat broken, but shows the degenerated patch occupying an irregular area in the center of the section, and reaching below to its margin. (Fig. 5, Plate II.)

6 and 7. *Transverse Section of the Chiasm and Right Optic Tract.* The degenerated patches occupy symmetrical positions in either end of the ellipse, being nearly centrally placed and gradually narrowing to a point of decussation in the center of the chiasm. (Fig. 6, Plate II.) In the optic tract the degenerated area at first occupies almost exactly the center of the tissue, and becomes less and less marked as the connection between this tissue and the midbrain is being formed. (Fig. 7, Plate II.)

The degeneration has attacked that portion of the optic nerve ordinarily known as the papillo-macular bundle, or the macular fascicle. It pursues a course similar to the one already described by Samelsohn, Vossius, Uhthoff, and other observers, beginning in a wedge-shaped area of degeneration on the temporal side of the optic nerve, which position it maintains, although in a somewhat altered shape, being at first heart-shaped and later crescentic, for about ten millimetres behind the globe. The area then approaches, but never quite reaches, the center of the nerve and maintains this position until it reaches the foramen. In the in-

tracranial portion of the nerve the patch again becomes distinctly crescentic and occupies a position above the center. In the chiasm the foci of degeneration are symmetrically placed slightly below the center, while in the tract the position is almost exactly central. Examination of the diagrams and slides further indicates, first, that the process was more intense and the degeneration more pronounced upon the right side than upon the left side. This corresponds with the visual field examination, which showed a larger scotoma upon the right side and a greater loss of color perception, with the production of spots of absolute scotoma. Second, that the degeneration both upon the right and left side is more marked in two situations, namely, just posterior to the lamina cribrosa, and, again, at the optic foramen, although just before reaching the latter point there is an area with patches of well-preserved nerves. (See Fig. 4, Plate I; Fig. 4, Plate II.)

FINER MICROSCOPICAL DETAILS. 1. *The Retina.* — The retinal elements, with the exception of the optic nerve-fibre layer and the ganglion cells, may be dismissed at once, because they present no abnormalities of interest in the present discussion. The nerve layer, especially as the fibres approach the papilla on the side corresponding to the degeneration in the temporal half of the optic nerve is narrower than normal, although it is to be remembered that the fibre layer is naturally less developed in the temporal than in the nasal retina. The contraction of this layer under similar circumstances has been noted by Bodecker and other observers.

The *ganglion cells* are normally placed and are not numerically decreased. Comparing them with those of a retina known to be healthy, they appear in the neighborhood of the nerve-head to be small and the development of their processes imperfect, a phenomenon which has also been observed by Sachs. In the macular zone, however, there is the usual increase in the number of ganglion cells, which are well constituted, exhibiting neither atrophy nor degeneration.

The coats of the *retinal vessels* are greatly thickened, a thickening quite in accord with arterial change elsewhere in the ocular tissues.

PLATE II.

FIG. 1.

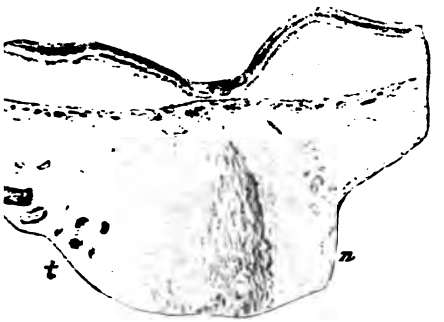


FIG. 2.

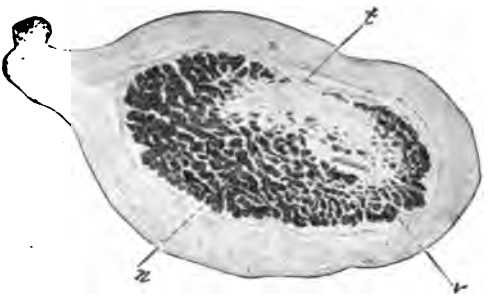


FIG 3.

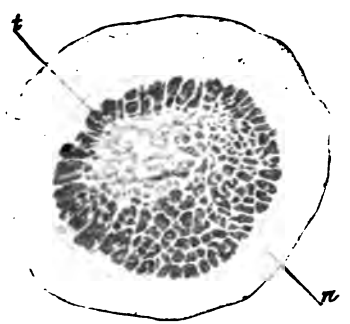


FIG. 4.

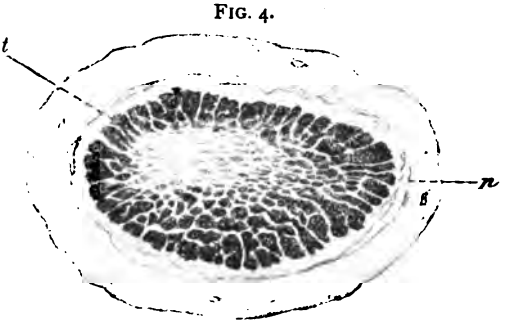


FIG 7.

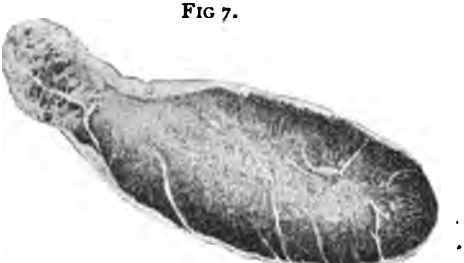


FIG. 5.

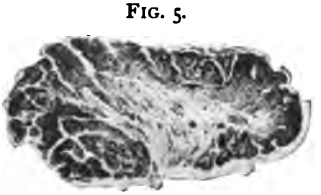


FIG. 6.

2. *The Choroid* is practically free from changes, save those referred to in the vessels.

3. *The Optic Nerves.* — The trabeculae of the laminae are thickened and compressed, and the vascular septa of the nerve (in cross-section) generally thicker than under normal conditions. The nerve fibres surrounding the patch of diseased tissue, situated as already described, present a normal appearance. As the lesion is approached, there is an augmentation of nuclei, a marked thickening of the connective tissue septa and a disappearance and degeneration of the nerve fibres. The diseased patch is sharply separated from its normal surroundings.

4. *The Vascular Changes* have been described in general terms. In particular it may be said that the small nutrient vessels of the optic nerve are greatly thickened, so greatly that in many places they are practically converted into small fibrous cords. The same changes are manifest in the walls of the major vessels, and, moreover, not only in those supplying the retina and optic nerve, but in others which happen to be shown in the tissues outside of the dural sheath of the nerve. The vena postica, which has been particularly described by Sachs as giving evidence of an endo- and periphlebitis, could not be identified in any of the sections.

Briefly, then, the changes in this case of central scotoma, which, so far as the history and the perimetric examinations are concerned, seems to belong to the group of the so-called intoxication-amblyopias, are: Degeneration of the papillo-macular bundle from the tract, though the chiasm and along the nerve until it reaches the nerve-head; marked thickening of the connective tissue of the affected area, with degeneration of the nerve fibrils, and hypertrophy of the walls of vessels, associated with a moderate increase in nuclei, within the fasciculi; some narrowing of the temporal nerve-fibre layer in the neighborhood of the papilla, and in the same region imperfections in the processes of the ganglion cells, which, however, in the macular zone are of normal construction.

With reference to the pathological process present in the optic nerve in cases of this description, there is some difference of opin-

ion, and, as has been well stated, "the descriptions of the optic nerves in the recorded cases agree quite as well with an inflammation of the connective tissue of the nerve causing secondary atrophy of the nerve fibres, as with a primary atrophy of the latter associated with secondary interstitial changes following in its track." The same doubt obtains in the present instance, although taking into consideration the marked thickening of the interfascicular septa, the vascular changes and the increase in the nuclei, both upon the edge of the degenerated area and within the fasciculi, even if this increase in nuclei cannot be said to be a marked one, the appearances correspond closely with those usually assigned to an interstitial sclerosing inflammation which Samelsohn compared with the same pathologic process visible in interstitial hepatitis.

As my specimens show extensive typical tract atrophy, far advanced, and the retinal sections from the same case only a moderate thinning of the nerve-fibre layer on the affected side, without any special change in the ganglion cells, which, indeed, in the macular zone appear practically unaltered, it is difficult to assume that these cells should be regarded as the starting point of this affection. In other words, this case fails to confirm the recent contention of Nuel[1] that central toxic scotoma is not primarily a neuritis of the macular bundles, but a disease of the macula lutea causing degeneration of its cells, and that the optic nerve changes are secondary to the destruction of the nerve cells of the macula. To be sure, there is no manner of doubt that macular fibre degeneration will follow experimentally produced retinal lesions, as has been shown in the excellent research of Usher and Dean,[2] and clinically, we know that atrophy of the tissue of the macula lutea, for example, in atrophic central retinochoroditis, or in so-called macular coloboma, will cause quadrant atrophy of the optic disc, precisely as this is seen in cases of intoxication-amblyopia. If a specimen of this character were submitted to microscopic examination, I have no doubt atrophy of

[1] Archives d'Ophtalmologie, October, 1895; March and August, 1896. The macular origin of central scotoma was advocated more than twenty years ago by Schoen, and later by Bayer and Treitel, who believed that the scotoma indicated a functional weakness of the center of the retina due to toxic agents.

[2] Trans. of the Ophth. Soc. of the U. K., Vol. XVI, 1896, p. 248.

the papillo-macular bundle would be found, precisely as it appears in the present instance.

Ophthalmoscopic changes in the macula have been described in cases of toxic-amblyopia by Nettleship, Hill-Griffith, and myself, although we did not attribute them to the influence of a toxic agent, but regarded them as coincidences. Macular changes have also been described by Nuel and W. G. Laws, but they are quite as indefinite as those previously recorded.

Nuel has experimentally produced optic nerve degeneration by administering extract of male fern, and thinks that this disease attacks first the nerve cells of the retina and that their destruction brings about the degeneration of the fibres of the optic nerve. Moreover, this degeneration occurs without the intervention of a neuritis. Recently the same author,[1] in a discussion on sympathetic amblyopia, refers to this subject (I quote W. G. Sym's abstract of his paper) as follows: "In a certain number of cases of filix mas amblyopia in dogs there is a distinct degree of neuritis, or at least of blurring of the papilla; but, microscopically, there is no trace of an interstitial neuritis, only an oedema of the nerve-head. This interstitial oedema is consecutive to the destruction of the nerve-fibres, and real neuritis, if it occurs, comes on later, but is neither interstitial nor retrobulbar. Many cases of toxic amblyopia are of this nature; they are instances of parenchymatous neuritis." In my own experiments in quinine-amblyopia,[2] the extensive degeneration of the whole visual tract which followed the administration of this drug occurred without preceding neuritis.[3] It was essentially a degenerative process, but, as an examination of my specimens will show, there were no changes in the ganglion cells of the retina. Therefore, while there may be a retinal origin of degeneration of the papillo-macular bundle, or, indeed, of more extensive disease of the entire nerve, it

[1] Archives d'Ophtalmologie, March, 1897.

[2] The Toxic Amblyopias: Their Classification, Symptoms, and Pathology, Phila.: Lea Bros. & Co., 1896, pp. 193-198.

[3] In my earlier experiments in quinine-amaurosis (Trans. Coll. of Phys. of Phila., 1890) I found in many sections in the earlier stages of the blindness, "that the trabeculæ were less marked and the individual fibrils spread apart, as if the tissue was œdematous and swollen." This observation is similar to the one made by Nuel in dogs suffering from the amblyopia of male fern.

evidently is not the usual or constant starting point of this lesion in so-called intoxication-amblyopias. Certainly, degeneration of the ganglion cells could not have been the cause of the atrophy of the macular fascicle in the present case, nor in several others which have been reported, notably those of Sachs, who, like myself, carefully examined the ganglion cells of the macula and found them normal. Neither can disease of these cells be held responsible for the atrophy of the optic nerve, which occurs in quinine toxaemia, if I may judge from the examination of a large series of sections in which no notable changes in the ganglion cells can be demonstrated.

In quinine and salicylic acid amblyopia, and as I expected I would find in filix mas amblyopia, but I was not successful in securing atrophy, the primary changes are vascular, sometimes, in the earlier stages, of the nature of a pure ischaemia, and later, if the influence of the poison continues, these functional vascular changes, if I may so express myself, become organic ones. Endovasculitis, thickening of the vessel walls, etc., appear, associated with degeneration and atrophy of the nervous tracts which they supply.

Sometimes a single tract is attacked, as in the tobacco and alcohol amblyopia, and again, an entire nerve, as in quinine amaurosis. Why certain tracts or areas are affected to the exclusion of others, we do not know. Perhaps the process depends upon nutritional disturbances similar to those which occur in certain tracts of the cord in pernicious anaemia, and which subsequently develop into atrophies resembling those seen in locomotor ataxia.

The belief of Sachs that the earlier stages of these intoxication-amblyopias must be sought for in vascular disturbances has a good deal to recommend it, and seems borne out by the action of other toxic agents. What exactly is the active principle which produces these nutritional disturbances we do not know. Sometimes it is tobacco, sometimes tobacco and alcohol combined, sometimes it is other poisons, as opium, hashish, iodoform, etc., and sometimes it is a toxin, as, for example, the toxin of diabetes. I have long ago contended that I did not believe it was

tobacco alone or its active principle, nicotine, which was the essential poisonous agent, but that one or more of the many principles freely present in tobacco smoke, or some toxic influence which they liberate in the system, must be held accountable for the disease. Sachs contends that even in the tobacco cases certain complex chemical combinations occur in the stomach and there is a resulting transformation of the normal gastric juices into acids of the fatty type which combine with nicotine into substances which are more injurious than the simple tobacco bases themselves. Experimental work now being carried on in Chicago under the direction of Dr. Casey Wood indicates that certain stomachic toxins are capable of causing in animals blindness probably of the type now under consideration.

MARKED IMPAIRMENT OF CENTRAL VISION FOLLOWING PROLONGED USE OF THE AFFECTED EYE.

BY SAMUEL THEOBALD, M.D.,

BALTIMORE, MD.

Mr. S., aged 30, a graduate student in the chemical department of the Johns Hopkins University, consulted me on February 16, 1897, on account of a pain and soreness which he had experienced for several days in and over his right eye. He stated that just after recovering from an attack of the grippe of a week's duration, he had taxed this eye very severely, and explained that he had been engaged in "calibrating burettes." Three burettes had been assigned him for this purpose, and he had spent about five hours a day for six consecutive days in testing their accuracy, or in "calibrating" them, as it is termed, using his right eye only. The burettes are graduated to tenths of a cubic centimetre, but an error amounting to only a tenth of one of these tenths can be detected by a trained eye, and it is such almost infinitesimal departures from absolute accuracy that the student is expected to note and record. As each burette has a capacity of 50 cc. and each one of these cubic centimetres must be gauged in this careful manner, it can be readily understood that the strain upon the eye must be very considerable. Some students, it seems, calibrate binocularly while others obtain better results by using only one eye.*

Mr. S's eyes had been slightly asthenopic for some time before the occasion which led him to seek my advice, but they had not annoyed him sufficiently to induce him to consult anyone in regard to them. At his first visit the ophthalmoscope showed nothing abnormal except the presence of a slight amount of hypermetropia, and there was nothing noteworthy in the external appearance of the eye. A lotion of opium and boracic acid

* In calibrating the diffuse light from a window is used, and falls upon the burette from one side, so that the gaze is not towards the light.

and a collyrium, containing one-eighth grain of sulphate of zinc and twelve grains of boracic acid to the ounce, were prescribed, and he was directed to report in a few days if not relieved. The vision was not tested at this visit. Two days later he was seen and stated that the eye was not improving. The R. eye then showed V.= 20/XXX+; the L. eye V.= 20/XV−. On February 20th, two days after this, several small, well-defined, whitish exudation spots were detected in the R. eye, in the neighborhood of the macula, such as are not infrequently observed in miliary choroido-retinitis due to accommodative strain. Feb. 24th, a careful test of the refraction was made, astigmatism was excluded, and +.87s glasses were prescribed to be worn, probably, only in near vision. V. of R. eye about as when first tested, 20/XXX. Feb. 27th patient reports sight of R. eye much dimmer. Right pupil is now somewhat larger than the left and is less responsive to light. R. eye V. = 20/CC. Ophthalmoscopic changes not appreciably altered. Calomel to be taken every hour in one-tenth grain doses. March 2d, R. eye V. = 8/CC. Ophthalmoscope shows, in addition to the exudation spots in the macula region, previously noted, slight inflammatory changes (exudative) in the retina near the outer and upper margin of the disc. Calomel discontinued and pilocarpin muriate prescribed, beginning with a dose (by the mouth) of one-sixth of a grain. Urine tested for albumin with negative result. March 5th, vision unchanged. Field of vision taken, showing a paracentral scotoma for white as represented in the accompanying chart. March 7th, an improvement in the vision is noted (14/CC), and from this time a progressive change for the better occurred. March 15th, V. = 20/LXX+. Pilocarpine discontinued, and 1/24 gr. hydrarg. biniod. prescribed, to be taken three times a day. March 29th, V. = 20/XXX−; scotoma has disappeared. April 19th, V. = 20/XX missing only one letter. Fundus examined without detecting anything abnormal.

May 3d, patient has been at work in the laboratory since April 1st, and has felt but little inconvenience from his eye, though he says he is conscious of not seeing as clearly with the right eye as with the left. Is still taking the biniodide. A careful inspection of the macula region shows two minute, whitish

spots still present and slight irregular pigmentation. The retina near the disc presents a normal appearance. R. V.=xx/20, except one letter, and three letters of 20/xv. L. V. = 20/xv—.

It would seem that the unusual strain to which the eye was subjected in this case produced a central exudative retinitis, not unlike that which has been observed as a consequence of prolonged exposure of the eyes to the direct rays of the sun or to the glare of the electric arc light. That the recently-recovered-from attack of grippe was a factor in bringing about this condition seems not unlikely.

The points of interest are that the decided decline in vision should not have occurred until so long a time after the strain of the eye (eleven days after his first visit to me and about eighteen days after he had finished testing the burettes), and that with such seemingly insignificant ophthalmoscopic changes the impairment of sight should have been so marked as it was (8/cc).

HYSTERICAL OR FUNCTIONAL BLINDNESS.

By ALVIN A. HUBBELL, M.D.,

BUFFALO, N. Y.

Cases are rare in which complete loss of vision takes place in one or both eyes without there being present fundus-changes or lesions of the optic nerve or brain to account for it, and in which, after several days or weeks, the vision begins to return and is finally restored. I am, therefore, led to report the following cases which have recently come under my observation:

Case I. Miss J. H., daughter of a physician, is a young woman eighteen years of age, who usually has good health, and is quiet in her manner and not emotional. Two years ago she had malarial fever, but fully recovered from it. The menstrual functions are normal and regular, and there is no evidence of uterine derangement. She has never had convulsions or any nervous disturbances suggesting hysteria.

On March 9, 1897, she was seized with pain in the left eye,

which extended over the left side of the head and into the left ear. This was so severe as to require anodynes for its relief. In three days it had nearly disappeared. The vision of this eye began to be affected soon after the onset of the pain and was very "foggy" the next day, March 10th. On the morning of the third day, March 11th, when she awoke she found that the vision of this eye was lost, not being able to distinguish even light with certainty. Her father took her to an ophthalmic practitioner in a neighboring town for consultation, and was given the opinion that it was a case of retinal thrombosis. A line of treatment was marked out and followed for a few days without improvement. The father's anxiety became so great that he determined to seek further advice, and, on March 16th, brought his daughter to me.

Examination of the eyes, externally, showed them to be alike in appearance and their movements normal. The pupils were of normal and equal size, but the reaction to light was a little slower and less complete in the left eye than in the right, there being a slight dilatation when exposed alone. There was manifest hypermetropia of 0.50 D. of the right eye, and vision was 5/4, Snellen's test-types. The vision of the left eye seemed entirely lost. There was, perhaps, a slight perception of strong light at the extreme temporal part of the visual field. But of this the patient was not quite certain. Ophthalmoscopic examination through the undilated pupils did not show anything abnormal in either eye. To ensure a more thorough inspection of the left eye, the pupil was dilated with homatropine solution. A most careful search was then made for some pathological change in the fundus, but not the slightest could be found. There was no obstruction in the retinal circulation or change in the vessels, no oedema, discoloration, or hemorrhage of the retina, and no changes of the optic disc. The retinal vein at the disc could even be seen to pulsate. Tension was normal. The patient complained of a "weakness" of the eye and some headache, and general weakness. I ventured the opinion that the case was one of so-called functional blindness. The father then informed me of the diagnosis of the colleague who had preceded me in the case. There being so much difference between us in regard to diagnosis,

I suggested that still another opinion be obtained. On the next day, March 17th, my friend, Dr. F. W. Abbott, kindly examined the case most carefully, and he, too, was unable to find anything, objectively, to account for the loss of vision. To him the fundus was entirely normal in every respect, except, perhaps, a slight engorgement of the retinal veins.

Dr. Abbott suggested that a leech be applied to the left temple and the patient kept quiet in a darkened room for a few days. His suggestion was followed, and the patient was also given five grains of iodide of potassium three times a day, and later there was added one-sixtieth of a grain of strychnine three times a day.

On March 19th there was distinct perception of light, and she could see the movements of my hand.

March 20th, she counted fingers held in the peripheral part of the visual field with difficulty.

March 22d, she counted fingers readily when held peripherally in the visual field. Left the darkened room and simply kept the eye covered.

March 23d, I began to apply to the eye the interrupted galvanic current of electricity for three to five minutes once a day.

March 28th, she read No. 60 Snellen at 1 meter (1/60), but only by looking to one side of it.

April 3d, she was able to read No. 60 Snellen at 5 metres (5/60), viewing the letters eccentrically. I examined the eye again with the ophthalmoscope, but the fundus was normal, as before. She returned to her home in the country, where essentially the same treatment was to be continued.

April 15th, came to my office again, and I found that vision had increased to Snellen No. 9 at 5 metres (5/9), and Jaeger No. 6 slowly at 10 inches.

From that time the vision has gradually improved, until she is now able to read No. 1 Jaeger, but with some effort. The large type seems more or less confused and she says the "vision is very weak." Still further improvement will undoubtedly take place.*

Although the vision for objects has become so nearly restored,

*June 20, 1897, Vision is 5/9, Snellen, and Jager 1, with difficulty. The optic disc s abnormally pale.

the color-sense is very much impaired. I have not been able to test this, but her father writes me that "she cannot distinguish colors. Red is black to her."

Another interesting accompaniment of the visual symptoms is the loss of function of the corresponding lachrymal gland. On one or two occasions when feeling badly, she has cried. The tears would trickle down the right cheek freely, but there was no lachrymation of the left eye. This, to me, is additional evidence of the functional character of the blindness.

CASE II. Mrs. S. has been a patient of mine for years. She is fifty years old, is the mother of several children, and has usually been in good health. She has passed the menopause without special disturbances, and has lately increased considerably in weight. She has hypermetropia 1.75 D. in each eye, the correction of which has given her normal vision, — Snellen No. 5 at 5 metres (5/5); and the correction of the presbyopia with + 4.50 D. has enable her to read Jaeger No. 1 at 14 inches.

On March 16th, after suffering a few days from a "cold," the vision of the left eye began to fail, and in three days she was unable to see with it. Not getting better after using some domestic treatment, she consulted me on April 3d. I found the vision of this eye was a little more than perception of light, but not sufficient to distinguish fingers or large objects distinctly. The external appearances of the eye were normal, and the pupil was of the same size as that of the other, and reacted as well to light. After dilating the pupil with a solution of homatropine, I was unable to find any pathological changes whatever in the fundus of the eye.

No lesions elsewhere were apparent, and there was no hemianesthesia.

I made the diagnosis here also of functional blindness and ordered small doses (five-grain) of iodide of potassium to be taken three times a day.

On April 15th, vision had risen to Snellen No. 15 at 5 metres (5/15), and at the present time (May 24th), it is 5/5 nearly.

Case III. Mrs. C., 30 years old, is rather slight in stature, is not strong and robust, and is of an active, "nervous" tempera-

ment. Eight years ago she gave birth to a son, and has since had some slight uterine displacement. She came in February last to Dansville, N. Y., from New York city, to visit her husband, who was at the Sanitorium for treatment. Before leaving home, she had been working unusually hard, by reason of some extra household duties that had come upon her, and was, therefore, much fatigued. A few days after her arrival, on February 19th, at about 5 P. M., while preparing her toilet for supper, she suddenly became dizzy. She started for the bed, but had taken but a step or two when she fell, striking the back of her head against the iron-bound edge of a large trunk. Shortly before six o'clock she was discovered. She says she remembers falling, but does not know how long she laid on the floor. It is estimated that it was twenty to forty minutes before she became conscious and assistance reached her. She was put to bed, simple restoratives were administered, and she was soon quite comfortable. She noticed a book lying on the foot of the bed, and, feeling so well, she thought she would read a little. As she raised up and leaned forward to reach it, she was seized with a "sudden and severe rush of blood to the head," as she described it. Dr. Gregory, of the Sanitorium staff, was called and she was soon made comfortable and remained so until about nine o'clock, when she was taken with severe pain in the head, this being worse in the occipital region, and accompanied by a sense of great pressure. To her, it was like "a cataract flowing copiously down the back of the head and brain." The pain was so intense that it was controlled only by the hypodermic use of morphine. During the night she became delirious at times, and she began to have "cramps," which affected, more or less, the whole body. Dr. Gregory characterized them as "cataleptic" in nature. These seizures were frequent, and lasted from "two to ten minutes." The pain, delirium, and convulsions began to diminish after two or three days, and had quite disappeared at the end of ten days. Nausea and vomiting were also frequent during this period. There were no emotional symptoms, no *globus hystericus*, no hemianesthesia. At no time previous to the fall had she had convulsions, dizziness, or "falling-sickness."

On February 20th, the next day after the fall, Mrs. C. began

to complain of dimness of vision in both eyes, and within twenty-four hours afterwards she was unable to distinguish even light with either eye. At first she said there was a sense of "glare," and this gradually changed to total darkness or blackness. The expression of her face was the vacant stare of any blind person. At times her eyes pained her considerably, but were never reddened or watery.

During the first two weeks she was thoroughly examined for fracture of the skull and lesions of the brain, but none could be found.

The vision not returning, while in other respects the patient had nearly recovered, I was called to see her on March 5th, just two weeks after the fall. She was then quite free from pain, and there had been no convulsions, delirium, or vomiting for several days. She was somewhat weak and still kept her bed. There were no symptoms of anesthesia or paralysis of any part, and the hearing and other senses, except vision, were very acute. Careful search made negative any lesion of the brain whatsoever, — contusion, hemorrhage, or compression. The injury at the back of the head had been so slight as to scarcely produce an abrasion.

The only abnormal conditions apparent at this time were the general physical weakness and the loss of vision, which was complete. I could not elicit any evidence of the slightest perception of the strongest light. The external appearances of the eyes were normal, and the movements of the balls and lids were unrestricted. The pupils were of equal and ordinary size and reacted quickly and fully to light.

To facilitate the ophthalmoscopic examination, I used a mydriatic, and after dilation of the pupils, made a most careful examination of both fundi. No abnormal appearance of any kind could be found in either the optic discs, retinal vessels, retinae, or other structures. The picture of the parts was one of perfect health and function.

The case appeared to me to be one of functional or hysterical blindness, and in this light I was able to give a favorable prognosis.

The treatment was directed towards the general improvement

of the patient and the use of electricity. She gradually gained in strength, but her vision did not change until the fifth week after the injury. On March 24th she thought there was more light in her room. On March 26th she could distinguish large objects, and on March 27th she could recognize faces. It was on this date that I visited her the second time, and I have not seen her since. But on April 23d she wrote me that the vision quite fully returned in both eyes shortly after my last visit, and that she was now able to see as well as ever, except that her eyes were "weak."

I submit these cases as belonging to that extraordinary class known as functional or hysterical. When the pathologist will give us an acceptable explanation of hysterical anesthesia of areas of the skin or of hysterical palsies of certain muscles, then we, by analogy, perhaps, may offer some *rationale* of the blindness in such cases as I have related. At present we are entirely in the realm of unsubstantiated theory, and I refrain from speculation.

A GROUP OF FOUR CASES OF OPTIC ATROPHY WITH NEARLY TOTAL BLINDNESS FOLLOWING SEXUAL EXCESSES.

By DR. JAMES A. SPALDING,

PORTLAND, MAINE.

Physicians generally will talk freely enough about syphilis and its terrible results in the human organization, extending from such an apparent trifle as a serous iritis, for instance, to the most serious cerebral disease, maiming the patient for life with paralysis and its sequelae, and often terminating fatally. But when it comes to a discussion of sexual intercourse, moderate or the reverse, which may or may not eventuate in syphilitic manifestations, then the topic seems to be dropped as if useless to discuss or as if wholly taboo.

At various and sundry times books have been written about what young people ought to know, but it is a sad fact that all

such books seem to die a natural death, because no one dares to mention them even by title, to say nothing of never dreaming of calling public attention to their possible value to the young of both sexes. The prevalent idea from time immemorial to this era seems to have been to let the young people learn for themselves by their own bitter personal experience what the sexual appetite actually is, and what its results may be. Results which, in the young men, terminating in neurasthenia, mental disturbances, and, as we shall soon see from my experience in practical ophthalmology, in inability even to earn a livelihood owing to partial or even nearly total blindness. Results allied to social death in a young girl, who, with her virtue lost, brings into the world an illegitimate child, a sorrow to herself and to her stricken parents. Therefore, when I see such things occurring in the city where I live (several instances of illegitimate births occurring of late years among the girls of our high school), and when I observe cases allied to blindness in another city in our state, then I feel as if, once more, I must raise a cry of danger in our leaving the young to find out what the sexual appetite may be.

As people can always become more interested in a given topic by telling them some story that shall point a moral, it has occurred to me that by offering to you my experience in a tragic case of immoderate sexual indulgence, you, as parents, or as educators, might be inclined to spread abroad another instance of the need of telling some young people what they ought to know. In my opinion if girls were taught that it was owing to their yielding to the slightest possible personal contact with young men or boys that was the real foundation for the arousing of the sexual appetite, more could be done than by talking to the boys. I doubt if a boy feels this appetite to any great extent until he touches some girl in an embrace of the mildest sort. And for that reason I hold that parents with daughters ought to teach them that to suffer a kiss or an embrace, outside of mere sportive games, where all are in sight, is likely to excite in boys a feeling from which the daughter will suffer shame if permitted when they are alone.

Whatever now may be the opinion of others it is with a feeling

of necessity of educating some parents to the needs of talking to the young, that I offer in a brief way some personal experience in this undiscussed region of morals.

And as it happened to me some years ago to observe a curious group of patients from almost the beginning, and later to carry out their history to its tragic end, I venture, with much hesitation, to bring it before the Society. With hesitation, I repeat, because no one likes to break so profound a silence as now prevails in educated circles concerning the utility of discussing the relations between the sexes, so far as their mutual passions are concerned.

It must have been eight or nine years ago that I first met a boy of about sixteen years of age who had vision of one-tenth in each eye. He neither smoked nor drank; he had no signs of syphilis; there was not a single blind person in three generations of his family that could be clearly traced without a failure in vision; he had no history in any way that could give me a clue to his great loss of sight. Personally, he had nothing to offer in explanation of his condition, which had come on simultaneously, so far as he could judge, in both eyes. There was no malformation of the skull or orbits, and up to three or four months before, his sight had been excellent. He had no explanation to offer, as patients sometimes have. I touched him in every direction that I could think of, except sexual excesses, but of such a cause for blindness I had never before heard, so that really I did not ask him anything in that respect. And even had I thought of this, as a cause, I should never have dreamed of asking a boy of about sixteen such questions. To me, he was an unbearded youth, and to think of his acquaintance with the other sex seemed entirely foreign to my mind.

But there in that patient was a plain optic atrophy, the typical white, shiny disc, the temporal half very pale indeed, the thin arteries and thicker veins, beginning to curve sharply over the extensively cupped papilla. And, to complete the picture, there was a well-marked central excentric scotoma, impaired central vision, and fairly good excentric vision, so that the patient could find his way about without difficulty, but could not see to sit at a

loom. Finally, the ophthalmoscope revealed normal refraction for the retina. In a word, there was in each eye a typical optic atrophy which had probably begun with neuritis, to judge from the jagged border of portions of the papilla in each eye.

The family history was good, the two parents both living, and two brothers and two sisters all in the best of health, and with perfect vision in each eye so far as could be discovered by careful questioning. There was absence of other tabetic symptoms, unless we rely on a slightly defective knee-jerk.

This patient received from me large doses of strychnia hypodermically. I began with a thirtieth of a grain, and increased gradually to the appearance of constitutional symptoms. The largest amount given, at any one time, was one-fifth of a grain, generally into the arm. At this point I may say that I cannot recall any patients in whom the use of hypodermatic strychnia into the region of the temples has been of any more service than when injected into the arm.

Galvanism was also employed freely through the eyes, temples, and about the head and spine. My notes do not tell the exact strength employed at any session. In fact, at that time, there was very little measuring of galvanic currents. We then used to have a twenty-cell battery, and give from three to eight cells, or even as many as ten through the eyes into the district behind the ears on the opposite side.

These remedies did not prove of the least benefit, and, after a thorough trial, extending over six or eight weeks, the patient left without my having gained any idea in regard to the aetiology of his strange affection.

Imagine my astonishment when, within a month, or possibly two months, a second boy about sixteen came under my observation with precisely the same optic atrophy and with the same amount of blindness in each eye. From this patient, who, as I soon discovered, had been sent to me by the former patient, I soon got a clue to the possible cause of the serious affection of the optic nerves.

This second boy, together with the first and two others, belonged to a so-called "club," all about the same age, who had

made the acquaintance of four girls also not more than eighteen years of age, who were willing to gratify to the utmost their sexual desires. Indeed, I think that the girls were the originators of the "club" party for the purpose of a moderate gain, and partly for the pleasure of belonging to something that was mysterious. So that several times a day, if the boys felt inclined, or only once if they felt disinclined for more, these four couples indulged their youthful desires in utter ignorance of the possible results to either partner. This went on for some months (the exact details being imperfectly confessed shamefacedly and extorted unwillingly from the patient) until one of the boys began to see dark spots before his sight with slight loss of distant vision, then inability "to see to the side," as he expressed it, and, finally, the direction of his machinery in the mill became difficult, owing to loss of vision for near objects. Then it was that the first patient had consulted me, and now the second came with precisely similar condition of the optic nerve, as careful tests revealed.

To this second patient, and, likewise, to a third and fourth (for all of these boys finally came under my care and observation for prolonged periods, inside of a year and a half), about the same treatment was given as to the first, with the addition of nitro-glycerine in small doses, amyl nitrate, which was useful at times in one of the patients, and silver nitrate. Just how often the inhalations of amyl nitrate were given I am unable to state at this length in time from the period of observation. And in regard to silver nitrate I will add that I have in some cases of optic atrophy dependent on hereditary influence seen considerable effect from the use of this drug in pill form, each pill containing a quarter of a grain of the remedy.

I can recall one patient to whom, following the advice of Mooren, I gave silver nitrate for many months with great benefit. This was a case of axial optic neuritis showing itself in the mother, and her three daughters in succession; in one daughter, in one eye only, in the two other daughters, in both eyes, but not in the son so far, though he has not yet arrived at the age (sixteen) at which the daughters have always been attacked. This remedy seems to increase the central vision in tobacco amplyopia, and

under its use I have seen distinct enlargement of the field of vision in typical central scotoma. Silver nitrate is occasionally used in intestinal disturbances, but, outside of our German confreres, I find no mention made of its use in ophthalmology, though I am personally persuaded of its benefits in optic atrophy, preceded by neuritis as shown by the jagged appearance of the papilla.

To conclude this therapeutical point, I rely chiefly on strychnia and silver nitrate in these cases, and have seen some improvement, except in the distinctly hopeless instances. The latter remedy should not be continued sufficiently long to tint the skin in the least. How it would act when used with the hypodermic syringe, I have no data for determination.

Some forms of mercury are advised in similar conditions of the optic nerve, but in all syphilitic diseases of this structure we should beware of the use of this drug, for it only hastens the end, causing great loss of vision. One patient in this group of four received several subconjunctival injections of the cyanide of mercury without effect.

Without going any farther into the details of the other members of this group of four boys it may be said, in brief, that in all, the symptoms were similar as well as the appearances, and that the treatment was varied from time to time in each case as the prolongation of the disease seemed to suggest.

Careful investigation failed to discover any hereditary influence in any of these patients, and the influence of syphilis, tobacco, and alcohol could be excluded with exactitude. The only possible cause seemed to me to be immoderate sexual indulgence, producing profound disturbances of the central nervous system, terminating in atrophy of the optic nerve.

I should hardly have dared to bring forward this questionable and rather objectionable group of hopeless boys were I not now able to terminate their sad and tragic history. All four gradually lost useful vision. They did not become actually blind, for they could see to get about when the sun was not too bright, but they were all unable to earn a livelihood in their chosen work in the mill. Neither were they able, owing to muscular spasms and

general muscular weaknesses and partial paralysis, to do common day-laborer's work.

The first outcome of one patient was a lingering death from phthisis, which was not hereditary in his family. Another died violently insane. A third wasted away with nerve-symptoms. The fourth, unwilling to live longer a burden on his friends, died from a revolver bullet self-sent to his brain when he was less than twenty-one.

Can we doubt that if these boys had been told that there was death in what they were doing, they would have gone on recklessly to the end? I doubt it, and for that reason I venture to publish my experience in this undiscussed field of human education. If a boy is told that the sexual impulse indulged means shame to his girl playmate, I think he will pause to consider, and if the girl is taught that her very touch is the key-stone to the impulse she will hold herself away from the fatal opportunity, in her desire for self-preservation.

A STUDY OF THE OPHTHALMIC CHANGES IN CHLOROSIS, PERNICIOUS ANEMIA, AND LEUCOCYTHEMIA.

BY CHARLES A. OLIVER, A.M., M.D.,

PHILADELPHIA, PENN.

Through the kindness of several of the writer's friends, the following most interesting grouping of cases has been studied both clinically and histologically in different departments of medicine, making a series of studies both by them and him, that, for thoroughness of detail, conscientious work, and completeness, have seldom been permitted in any single contribution that the writer has had the privilege to heretofore publish. Each department of work has been superintended by one who is competent in the performance of his duties, and the studies having been done simultaneously, the list of cases here given, becomes not only valuable as a symposium of result, but must be considered as useful in illus-

trating the difference of expression in the ocular changes found in a few of the most important of blood-dyscrasia.

Beginning with the commonest variety in which there is a lessening of the number of the red corpuscles in the vascular channels, producing, or at least associated with, the usual train of subjective and objective symptoms (mostly of a functional type), the evil consequences of diseased condition of the blood-making organs, of improperly functioning blood-material, and of irritated, inflamed, and degenerate contiguous tissue and related viscera, are all soon reached. Each form of disorder having some organic casual basis; each possessing some peculiarity by which its type is known; and each evidencing its presence by a grouping of interdependent symptoms, it cannot be wondered that the ocular signs may in many instances be considered pathognomonic. Especially is this so in the vascular changes both in and about the eyeball; changes that are not only recognizable to the naked eye and to the magnifying lens, but which are so plainly manifest to the ophthalmoscope.

When to this clinical study, careful post-mortem examination, both macroscopically immediately after death, and with the microscope after certain chosen tissues have been properly hardened and appropriately stained, has been made, the relative changes found in the different forms of disorder at once assume a value that cannot be underestimated.

The subject-matter in this paper embraces an analysis of six cases recently seen in the writer's practice.

CASE I. *Chlorosis in a young female. Marked neuro-retinitis without any pronounced ocular symptoms. Diminution of red corpuscles to less than one-third of normal with great lessening of hemoglobin. Subsidence of inflammation of nerve-head and surrounding retina, with restitution of blood constituents to proper proportions by the internal administration of iron.*

On the third of February, 1897, M. J., a seventeen-year-old school-girl, applied at my clinic at Wills' Eye Hospital. In addition to her eye symptoms (blurring of vision with intense right-sided supra-orbital pain increased by near work), she gave most, if not all, of the typical gross signs of chlorosis. There were diz-

ziness, vertigo, tinnitus aurium, neuralgia, tachycardia, capricious and weakened appetite, scanty menstruation, and chronic constipation; this grouping in spite of treatment having increasingly persisted for more than two years.

In appearance, she was small, though fairly framed and well-developed for her age. Her face presented the characteristic greenish pallor of the disorder. Her lips were pallid, her conjunctivae were blanched, and her sclerotics were pearly white.

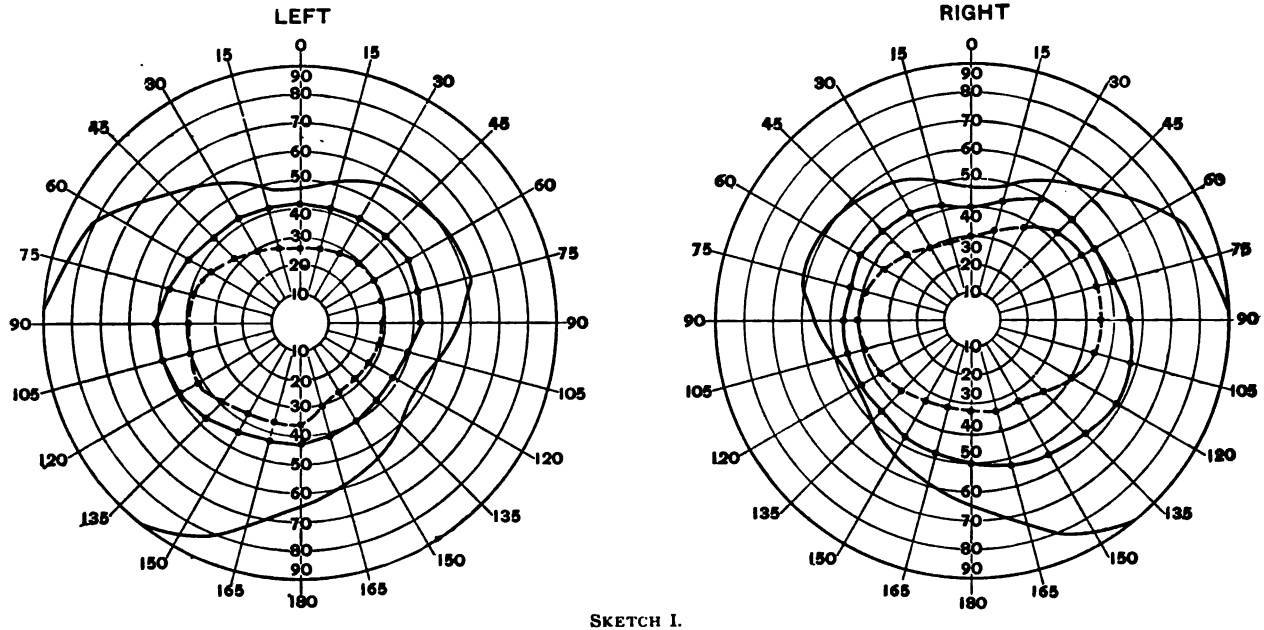
Distant vision in the right eye was reduced to two-thirds, while that of the fellow eye was normal. Accommodative play was good. The pupils equaled three millimeters in size and the irides responded freely to light, accommodation, and convergence. A slight exophoria for distance existed. Ophthalmoscopic examination revealed a well-pronounced neuro-retinitis that was different from that seen in association with gross refractive error. The disc was somewhat pallid, there was chorioidal pallor, marked tortuosity of the retinal vessels, especially of the veins, with a slight flattening of the venous walls, and a broadening of the light-reflex upon the arteries with a tendency to pallor of the contained currents. These conditions, as shown in figure 1, plate I, made from a water-color sketch by Miss Margaretta Washington of this city, were more marked in the left eye.

In each eye there was a low degree of compound hypermetropic astigmatism.

The fields of vision for red and white, as can be seen in the accompanying charts (sketch 1) were diminished, this contraction being more marked in those belonging to the eye with the greater degree of neuro-retinal inflammation.

Careful examination for the determination of any gross physical sign failed to show any evidences of organic disease. The urine, which was quite transparent and clear, and which was of normal reaction, had an average specific gravity, and was devoid of any sediment.

Believing the ocular symptoms to be dependent upon the general condition, and as there did not seem to be anything else to account for the patient's depraved health, but a deficiency of some


LEFT
RIGHT
0
15
30
45
60
75
90
105
120
135
150
165
180
10
20
30
40
50
60
70
80
90

SKETCH I.

type in the blood, I sent her to Dr. Alonzo Englebert Taylor, Associate at the William Pepper Laboratory for Clinical Medicine, whose skillful and frequently repeated examinations substantiated my view of the case and fixed the diagnosis. He found that the red cells equaled 2,600,000, that the white ones numbered 5,624, and that the hemoglobin amounted to but twenty per cent. The red cells were very pale. There was some poikoilocytosis with a few normablasts. Differential count of the leucocytes showed them to be normal.

One week later, the patient having been placed upon full doses of Blaud's pills, and situated under the best hygienic conditions that could be obtained, it was found that the red cells equaled 2,500,000, the leucocytes numbered 12,084, while the hemoglobin had increased to twenty-four per cent. At this examination there was the same condition of red cells. As may be noticed in this report, an ordinary "digestion leucocytosis" was manifest.

Two weeks following, under the same treatment and improved surroundings, the red cells rose to 3,280,000, and although the white cells equaled but 2,226 (which was to be accounted for by a temporary fastening), the hemoglobin had increased to forty-five per cent. (more than double of what it had been three weeks before). No nucleated red cells could be found. The other conditions of the blood were the same as before.

Two weeks later, under a continuance of the same plan of treatment, the red cells had increased to 4,090,000, the white cells had risen to practically normal (5,624), and the hemoglobin had gotten to seventy-five per cent. For the first time the blood in stained preparations, appeared quite normal.

A fortnight later, the blood constituents were quite normal, the red cells equaling 4,190,000, the white ones amounting to 5,080, and hemoglobin having risen to eighty per cent.

As the result of these examinations, Dr. Taylor stated: "I think that the case is one of pure chlorosis, and the blood regeneration under treatment very striking."

Coetaneously, with the betterment of the blood, the neuro-

retinitis subsided, leaving but a few insignificant traces of degeneration and thickening. Vision, which was unimproved by lenses, rose to normal, and the visual fields for both form and color became full and properly saturated in tint.

CASE II. ***Anemia, probably secondary to some trunkal neoplasm in a middle-aged, otherwise healthy, woman. Ophthalmoscopic picture of early changes in chorioid, retina, and optic nerve.***

On the second of March, 1897, I was privileged to commence a series of studies upon A. McC———, a fifty-four-year-old Irish woman, who was in the medical wards of the Philadelphia Hospital, under the care of my colleague, Dr. Frederick P. Henry.

Without any family history of relevant character, she stated that for one year past she had suffered from general malaise, impaired appetite, diarrhea, and gastralgia, accompanied at times with bilious vomiting. As a rule, the emesis followed the ingestion of a hearty meal, and was associated with lancinating pains in the precordial and epigastric regions. Gradually increasing emaciation was taking place.

When first seen she was extremely weak. A harsh systolic murmur, seemingly not hemic in type, could be heard over the cardiac apex about the left second cartilage.

Examination of the urine proved negative. An extended study of the blood showed a normal count for the white corpuscles. The red cells, however, which were in various stages of degeneration, were diminished to but 1,050,000, while the hemoglobin was reduced to twenty-five per cent.

The pulse grew rapidly feeble. The murmur could be heard over the entire cardiac area. The skin and conjunctival surfaces became distinctly lemon-tinted. A week later, marked tingling in the extremities and anasarca appeared. At present writing the patient is much worse and is not expected to live.

The ocular examination of this case of pernicious anemia, caused by some probable gross neoplasm, was extremely interesting. Corrected vision in each eye showed that that of the right was equal to but one-third of normal, while that of the left eye was not far from proper acuity. The accommodative play was ex-

PLATE I.

Margaretta Washington pinxt

Fig 1.

Fig 2.

F Moran lith Phila

cellent. The fields of vision which were concentrically reduced to about one-half, failed to evidence (in an intelligent patient) the existence of any scotoma. The right pupil was a trifle the larger, this probably being partially dependent upon a moderate degree of myopia with slight astigmatism.

The irides enjoyed free play to light-stimulus and efforts for accommodation and convergence. Thirteen degrees of exophoria for near and far, with four degrees of hyperphoria at five meters, distance, showed at once a pronounced disturbance in the extra-ocular muscle equilibrium.

The condition of the eye-grounds, which are well represented in the accompanying reproduction (figure 2, plate I) of a water-color sketch made by Miss Washington, showed a picture that could be fairly attributed to the blood disturbance, *i. e.*, it was expressive of the earliest ophthalmoscopic appearances found in pernicious anemia. As can be seen, there was an incipient neuro-retinitis, with a low-grade edema. Tortuosity of the retinal vessels, a darker venous current and a paler arterial one than normal, a slight pallor of the chorioidal tissues, and a tempero-macular grouping of deeply-seated blood degeneration spots, all were manifest.

CASE III. *Unmarried Negress comes for correction of slight refraction error. Conjunctivae almost transparent and scleras excessively pale. Sclerosis of nerve fibre layer of retina. Yellowish pallor and apparent dense hardening of optic nerve head. Retinal vessel currents pallid, with lymph-sheath wall thickening and opacification. Examination of blood proves the case to be one of pernicious anemia. Recovery doubtful.*

Through the recommendation of Dr. Samuel P. Bartleson of Clifton Heights, in this state, A. M., an unmarried Negro of twenty-three years of age, came to Wills' Eye Hospital on the fourth of November, 1896. The patient complained simply of cephalagia situated in the vertex and supraorbital region, which was increased by near work. Her distant vision in each eye equaled two-thirds of full acuity, and her accommodative range and region were both proper for her age and refractive condition.

The pupils were oval with their long axes, which were about

three millimeters each in length, situated slightly down and out. The irides were prompt and responded to light-stimulus and efforts for accommodation and convergence. There was slight exophoria for distance.

Closer inspection showed that the conjunctivae were almost transparent, and that the scleras, where not covered with pigment, were excessively pale.

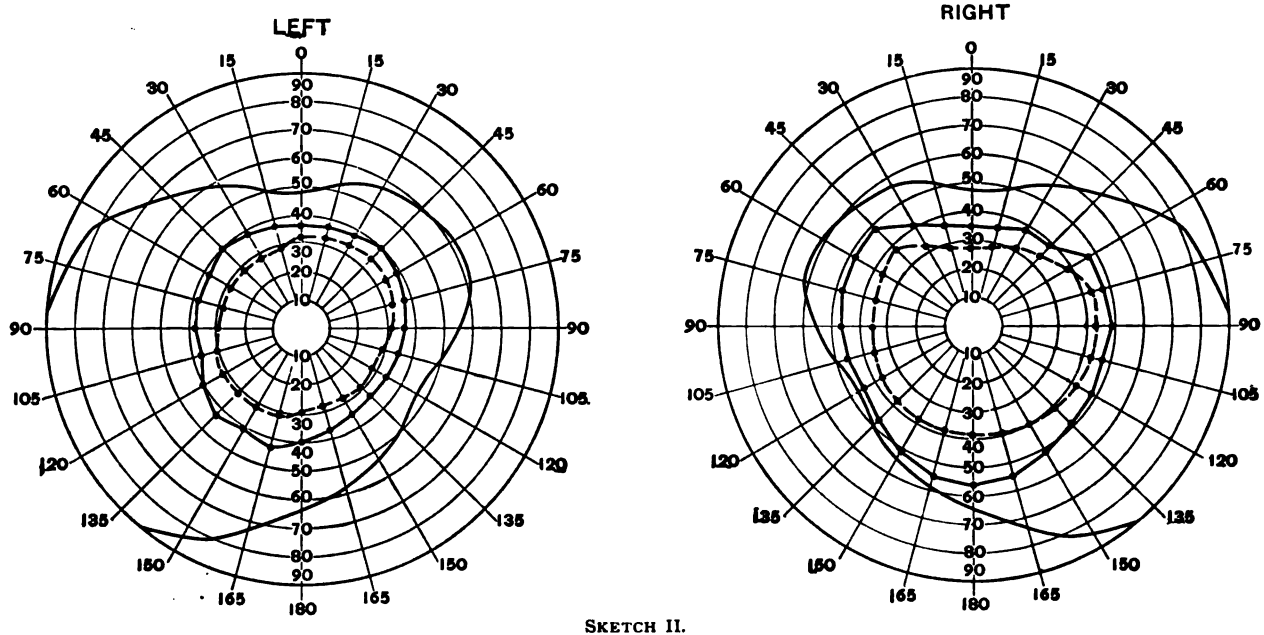
Ophthalmoscopic examination revealed a remarkable picture in each eye. As shown in the accompanying reproduction of a sketch of the right fundus by Miss Washington (figure 3, plate II), the surface of the disc was of mottled yellowish white. Its edges were hazy and at places were almost indiscernible. The fibre-layer of the retina, which itself was visible to a more or less degree throughout the fundus, was thickened, opaque, and intensely striated. The underlying chorioid so unlike that which is so common in the Negroid race, was but sparingly and irregularly pigmented. The retinal veins and arteries, particularly the former, were pallid, with a thickening and pronounced opacification in many places of their lymph-sheath walls. To the nasal side of the disc two faintly marked lymph massings could be dimly seen.

The fields of vision for white and red, especially the former, as shown in sketch 2, were markedly contracted.

Careful testing and retesting of the urine failed to show any coarse disturbance or evidence of general dyscrasia.

In consultation with my colleague, Dr. William F. Norris, we both believing the case to be one dependent upon general blood dyscrasia, I sent her to Dr. Taylor at the William Pepper Laboratory of Clinical Medicine, with the request that he make an analysis of her blood.

The result, as here given, far exceeded our expectations. The red cells amounted to but 1,608,000, and the white ones were decreased to 3,490. The hemoglobin equaled but twenty-two per cent. The red cells were quite irregular in size, both microcytes and macrocytes being present. A few nucleated red cells could be seen, but there were some of all types. None of them could be determined to be in the process of cell division.


LEFT
RIGHT
0
15
30
45
60
75
90
105
120
135
150
165
180
10
20
30
40
50
60
70
80
90

SKETCH II.

A differential count of the leucocytes gave the following remarkable result: neutrophilic polynuclear cells were found to the amount of 51.2 per cent.; the oxyphilic polynuclear cells equaled 2.4 per cent.; the mononuclear and transitional cells had risen to 15.2 per cent.; while the lymphocytes amounted to 31.2 per cent., making the total of 100 per cent. bulk.

There was an excess of the lymphocytes and mononuclear cells. By studying the metabolism, the case was shown to be one of pernicious anemia.

One month later, the conditions were found to be somewhat better. The red cells amounted to 2,175,000, the whites equaled 6,760, and the hemoglobin had slightly increased (twenty-three per cent.). The condition of the red cells had not changed from that of the former examination, while differential count of the leucocytes showed them to be normal.

Two months later, the blood was again studied, with the following result: The red cells equaled 1,800,000, the white numbered 6,540, and hemoglobin had risen to thirty per cent. The histological conditions of both the red and the white cells remained the same as before.

Thus, finding that the case failed to improve during dispensary treatment with courses of iron and bichloride of mercury, determined me to send it to the Hospital of the University of Pennsylvania for ward treatment.[1]

CASE IV. *Fibroid phthisis of five years' duration in a thirty-eight-year-old white man. Pernicious anemia. Red corpuscles reduced to one-twentieth of normal, whites to one-half, and hemoglobin to twenty-five per cent. Characteristic eye-grounds of pernicious anemia. Death. Autopsy. Histological study of sections.*

On the twenty-third of February, 1897, C. B., a thirty-eight-year-old driver, was admitted to Dr. Frederick A. Packard's service at the Philadelphia Hospital. The patient's mother died of senility and his father of paralysis. He stated that he had had typhoid fever and malaria. His present trouble, pulmonic cirrhosis associated with great general wasting, dated back for five years.

[1] If possible a further report of this case will be given later.

The patient's blood count when first seen showed but 670,000 red corpuscles with twenty-five per cent. hemoglobin. There was pronounced poikoclocytosis, with both maglocytes and microcytes. No nucleated red corpuscles could be found.

The skin was of a distinct lemon color and there was myedema. The mucus membranes were pale and the tongue was white. A soft systolic murmur could be heard. The spleen was not enlarged. The knee-jerks had disappeared.

One month later the patient was noted as failing. His skin had assumed a greenish-yellow hue. There was the death color of the lips. Carotid pulsation and hemotogenous jaundice were both present.

Re-examination of the blood at this time showed that the red corpuscles had fallen as low as 300,000, the whites to 2,500, and the hemoglobin to twenty-four per cent. Nucleated red corpuscles were present. At this time, through the courtesy of Dr. Packard and the kindness of one of my resident surgeons, Dr. J. J. Rectenwald, I was enabled to make an examination of some of the more important objective ocular symptoms. The pupils were of the same size. The irides responded equally to light-stimulus. There was a marked tremor of the orbicularis muscle of the right eye. The fields of vision, as well as could be taken, were reduced concentrically. The eye-grounds were about the same on each side, as shown in figure 4, plate II, faithfully drawn in water-colors by Miss Washington, and illustrating the appearance of the right fundus. There was a disposition to hemorrhages into the retina that were characteristic of both the Quincke and the Horner types. The disc was pallid. The retina was somewhat edematous in the naso-macular region. The larger hemorrhages, which, as a rule, were deeply seated beneath the fibre-layer of the retina, presented both white and grayish centres, and, as shown in the figure, one enveloped a portion of the lower temporal vein. More careful study made it apparent that a few of the white areas in the hemorrhages were due to leucocytic aggregation, though the bulk of them were dependent upon tissue-degeneration.

The case died upon the sixteenth of May. The post-mortem

PLATE II.

Margaretta Washington pinxt.

F Moras lith. Phila.

Fig. 3.

Fig. 4.

examination made upon the following day by Drs. Packard and Rectenwald showed double chronic fibrous pneumonia with effusion in the left side from acute pleurisy. There were some gastric ecchymoses. The kidneys were normal. The spleen was somewhat enlarged. The heart was fatty, and the bone marrow was slightly reddened.

Both retinae, with the attached optic nerves as far as the chiasm, were removed for me by Dr. Rectenwald, and given to Dr. J. Dutton Steele, Associate in the William Pepper Laboratory of Clinical Medicine, who, after preparing and cutting a series of sections for me in order to determine the existence of sacculation and ampulliform dilatations, submitted to me the following interesting and valuable report:

"The posterior portion of each globe was hardened in Muller's fluid. The nerves were removed close to the eyeball, and serial sections of various segments from the globe to the foramen cut. Those stained with hematoxylon and eosin showed the vessels and connective tissue framework to be normal. Other sections were stained by the Weigert and Weigert-Pal method, and disclosed no degenerative process in the medullated fibres. Search was made for the macula before imbedding the globes, and, as far as possible, the sections were made so as to include the papilla and macular region in the same section. These sections were stained by hematoxylon and eosin, thionin, and carmine. The sclera and choroid, on both sides, were healthy. The vessels of the choroid were filled with blood, while those of the retinae were, for the most part, empty.

"In the right retina, there was evidence of some edema of the outer reticular layer for some distance to one side of the papilla (probably between the macula and the papilla). The fibres of this layer were pushed aside and compressed by clear spaces and the inner and outer nuclear layers were compressed and separated.

"Numerous hemorrhages of varying size were found uniformly in the fibre layer and between the ganglion cells on the same side of the papilla as the edema. The red blood cells were unchanged and had retained their shape.

"In one section about the center of the edematous portion, there was an area that showed several swollen and varicose nerve

fibres in the fibre layer. These appeared as homogeneous bodies, lying in the outer portion of the layer in the vicinity of the ganglion cells. The fibre layer was thickened and the nuclear layers were compressed and pushed closer together. These bodies stained a greenish-blue with thionin, and a yellow-red with carmine, taking the eosin stain with varying degrees of intensity.

"The blood vessels of the retina and the papilla and nuclear layers were all normal. No inflammatory process could be observed in any of the sections."

The histologic findings in this case were most interesting, especially in regard to the swollen and varicose nerve fibres in the fibre layer of the retina, which in all probability were examples of the varicose and non-medullated nerve fibres described by Uthoff and de Schweinitz, and, as pointed out by these observers, somewhat resembling swollen and degenerate ganglion cells.

CASE V. *Probable hematophilia in a Negro. Examination of blood shows pernicious enemia. Death. Gross organic changes found post mortem. Histologic study of specimens.*

On the tenth of February, 1897, S. B., a seventy-year-old Negro, was admitted to Dr. John H. Musser's and Dr. Frederick A. Packard's medical wards at the Philadelphia Hospital.

The sole history that could be elicited was that of a persistent epistaxis dating from a traumatism that had occurred several days previously.

The patient was listless and apathetic. He had diarrhea. There were several attacks of bleeding from the nostril. The only gross physical sign, which was in any way certain, was a faint distant cardiac murmur.

The blood count seventeen days after his admission to the hospital, showed all the vascular signs of a pernicious anemia.

There was a lowering of the red corpuscles to 1,008,570; the white corpuscles were about normal (5,236); and there was but thirty-five per cent. of hemoglobin. Eosinophiles, polynuclear leucocytes, mononuclear poikiolocytes and nucleated red corpuscles were all present.

On the fifth of March, following, an attempt to inject six fluid ounces of human blood with two fluid ounces of a three per cent.

solution of phosphate of soda into the cephalic vein of the right arm, dyspnea, profuse perspiration, rapid respiration, feeble pulse and nose bleed, followed in two hours by uncontrollable bleeding from the wound in the arm, appeared.

When I first saw him, the scleras were pearly white, and the conjunctivae were almost transparent. The left eye showed all the external evidences of an old iritis; the vision of this eye being reduced to an uncorrectible one-seventh.

The eye-ground of the right eye, which could be more plainly seen than that of the fellow eye, gave a remarkable picture (figure 5, plate III, reproduction of a water-color sketch by Miss Washington). New and old hemorrhages both superficial and deeply seated with claret-tinted, tortuous, and flattened veins were discernible. The currents of the retinal arteries were, as can be seen, extremely pallid. The entire eye-ground was edematous, and the nerve-head, which was unusually pale, stood out in vivid contrast with the most peculiarly tinted ground. Heaps of granular matter sinking deeply into the retinal substance; degeneration areas going through to the sclera in the papillo-macular region; and variation in the intensity of the pigment layer, all were pronouncedly visible.

A few days later the patient died. The post-mortem held by Dr. David Riesman, one of the Assistant Pathologists to the hospital, gave the following findings: Tuberculosis of the mesenteric and retro-peritoneal glands; bulbous emphysema of the left lung; bilateral pleural effusion; old pleuritic adhesions on the right side; echinoccoccus cyst in the liver (1½ inch by 1½ inch in size); chronic interstitial and parenchymatous nephritis; and splenization of the bone marrow.

The globes and optic nerves, obtained by Dr. Rectenwald, were hardened in Muller's fluid, imbedded and stained by Dr. Steele as in the previous case. His report is as follows:

"The same difficulty in finding the macula was experienced here as in the other specimens, as the retinae were even more folded. The nerves were healthy and there was no degeneration of the myeline sheaths.

"The sclera and choroid were normal. The outer reticular layer of the right retina was slightly broader than normal, and

suggested an edematous condition, but this was not as marked as in the first case. This change was evenly distributed on both sides of the optic disk. The papilla itself appeared normal. There were a few hemorrhages of varying size in the same region. These were in the outer and inner nuclear and outer reticular layers. The vessels and cellular elements presented no change.

"In the left retina there was a slight edema of the outer reticular layer, on both sides of the papilla, which was similar to that described in the other retinae. In the fibre layer a little to one side of the papilla (probably to the macular), the fibres were swollen and varicose. The layer was swollen to such an extent that its breadth equaled that of a normal retina, causing a projection anteriorly that must have been very noticeable in the ante-mortem examination.[1] The swelling consisted of varicose nerve fibres similar to those described in the right retina of the first case. No trace of ganglion cells were visible. On the inner periphery of the nodule, there was small hemorrhage.[2] No inflammatory change could be seen in any of the sections. The inner and outer nuclear layers to the outer side of the nodule were pushed together and compressed into a narrow bridge of tissue. There were numerous hemorrhages (some of considerable size), scattered through the fibre layer in the vicinity of the varicosity.

"This varicosity, which was in all of the sections, cut through the papilla. The cup appeared healthy. The blood vessels of the retina and optic disk were normal."

CASE V. *Splenic leucocythemia in a forty-four-year-old Italian. Blood studies indicative of mixed or leucocytic type of leukemia. Characteristic fundus-oculi changes. Death.*

M. M., a forty-four-year-old Italian laborer, was admitted to the medical wards of the Philadelphia Hospital under the care of Dr. Frederick A. Packard, on the fourteenth of September, 1896. He stated that both of his parents were alive and well. He had been in the United States of America for five years, and, with the exception of an attack of malaria two years before, he had been healthy until four months previously. At the time of the first

[1] See ophthalmoscopic description and chromo-lithograph.

[2] The formation was evidently an exquisite example of the varicosities described by Uthoff and deSchweinitz.

examination he complained of general debility, constipation, failure of appetite, excessive sudorosis, epistaxis, cephalalgia, vertigo, attacks of blindness, and dullness of vision. There was no obtainable venereal history. He drank both malt liquors and spirits moderately.

Physical examination showed that there was no cardiac lesion. The liver, though possibly increased in size, seemed normal. The spleen was enormously enlarged. It extended from the mid-axillary line of the sixth rib to within one-half of an inch of the crest of the ilium, and one inch to the right of the median line a little below the umbilicus anteriorly. Posteriorly, it reached to the seventh rib and spinal column.

There was edema of the extremities with tenderness over the sternum.

A blood count made by Dr. Packard on the day after the patient's admission into the hospital, showed that while the red corpuscles were reduced to 2,586,000, the whites had increased to the prodigious number of 56,844. The hemoglobin had fallen to forty-five per cent. of normal. Some myelocytes were present.

Four days later, a second examination of the blood was made by Dr. Packard. At this time, although the red corpuscles had slightly increased (2,960,000), it was found that the white ones had lessened to nearly one-half of the previous number (30,000). A differential study of the components of the white corpuscles showed that about twenty-eight per cent. were polynuclear in form; forty-five per cent. were mononuclear and myelocytic; fifteen per cent. was found to be composed of lymphocytes, and transitional forms; while about one-half per cent. were eosinophilic in type.

At this time the spleen was found to be reduced to one-half of its former size. The sternal pain had increased.

A third examination of the blood by Dr. Packard gave practically the same findings as at the previous counts (the reds equaled 2,312,500; the whites 36,250; with forty per cent. of hemoglobin.

Five days later, a croupous pneumonia appeared. In spite of this, although of course influencing the actual data found, Dr. Taylor, through the kindness of Dr. Packard, made a most care-

ful analysis of the blood changes; his report exhibited the following result:

The red cells equaled but 2,995,000; the leucocytes were increased to 32,154; and the hemoglobin amounted to but forty-two per cent. The specific gravity of the blood was 1,046. Its alkalinity (v. Limbeck's method) corresponded to 0.520 Na Ho in 100 cc. of blood. The red cells were markedly altered. Poikoilocytes, microcytes, and macrocytes were abundant. There were not many nucleated red cells, most all of these being normablasts.

No red cells in nuclear division could be seen, nor were there any degenerative changes noted in the red cells. There was no albumosis, nor were there any peptomes in the venous blood, from which the specimens for the alkalinity and specific gravity has been derived. A differential count of the white cells gave the following figures:

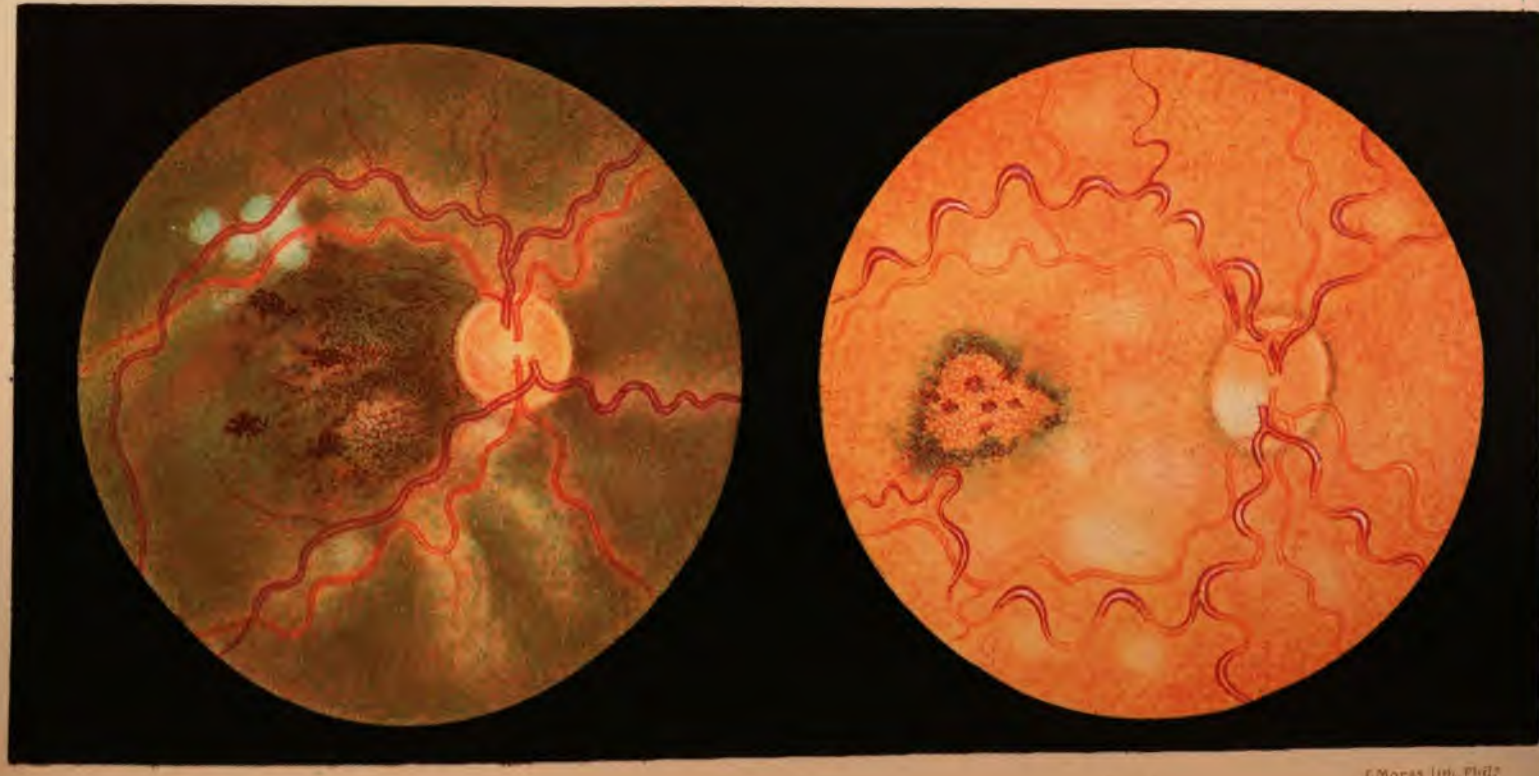
Neutrophilic polymorphous cells equaled, . . .	42.96%
Oxyphilis polynuclear cells amounted to, . . .	0.16%
Simple mononuclear and transitional cells equaled, .	15.15%
Oxyphilic mononuclear cells amounted to, . . .	0.64%
Myelocytes equaled the remarkable number of, . .	38.69%
Lymphocytes amounted to, ...	1.92%
While the degenerated cells equaled, ...	0.48%
Making a total of (bulk), ...	100.00%

There was a marked polymorphism in the white cells; the size of the nuclei; the arrangements of the nuclear chromatin; the situation of the nuclei; the amount of reactions of the protoplasm; and the quantity of neutrophilic granulations varing greatly. No white cells were seen in cell division; nor were they found to contain fat or an excess of glycogen. As the result of this study, Dr. Taylor stated that "the case belongs to the class best known as the mixed or leucocytic type of leukemia."

In seven days' time the patient died, no post-mortem being allowed.

The eye-grounds, as shown in chromolithograph (figure 6, plate III) of the right side from a water-color sketch by Miss Washington, was characteristic of leukemic neuro-retinitis with both aggregation and degeneration changes. The orange-yellow

PLATE III.



Margaretta Washington pinxt

Fig. 5.

Fig. 6.

F. Moras lith. Phila.

choroidal reflex; the pallor of the currents of the retinal veins with the flattened and somewhat opaque and tortuous condition of the vessel walls; the almost orange tint of the arterial currents with their broadened, undulating, and almost invisible channel walls; and the increased broadening of the light reflexes at places; all serve to help make a typical picture. If to these peculiarities, the numerous leucocytic aggregations and the old hemorrhagic degeneration-area in the tempero-macular region, with its abundant sacculations and fresh extravasation masses, are added, the eye-ground changes become almost complete.

STANDARDS OF FORM AND COLOR-VISION REQUIRED IN RAILWAY SERVICE.

BY CHARLES H. WILLIAMS, M.D.,

BOSTON, MASS.

If we consider the present condition of railway service in this country we find that express passenger trains often reach a speed of sixty miles an hour during some portions of their runs. With a train of four or five Pullmans and a baggage-car, running at this speed, a distance of about 1,500 feet is needed, on level track, in which to recognize the signal, apply the brakes, and bring the train to a stop, if necessary. Important points are guarded by semaphore signals, which have a movable arm about 4½ feet in length, and from 7 to 10 inches wide. When seen at a distance of 2,500 feet, such a signal will subtend with its average width the same visual angle as the width of Snellens xx foot test letters at 20 feet, that is, one minute; but as the length of the signal is more than five times its width, the length will subtend a little more than the standard angle of five minutes, which corresponds to the height of Snellen's test letters, and is the visual angle under which they should be read by a normal eye. A semaphore signal of this shape has been found the best for conditions of service, and if it is seen against the clear back-

ground of the sky, its position, horizontal for danger, or at an angle with the horizon for safety, can be easily seen under favorable conditions of atmosphere and background at a distance of over a mile. Such conditions are not always found; the air may be hazy or smoky, or the background may be a building, a bridge, a green or brown hillside, etc., which will seriously interfere with the visibility of the signal. Again, in rain, snow, or fog, such a signal cannot be seen until the train is very near to it, so, in addition to the red home signal near the point to be protected, another green or distant signal is placed at about 1,500 feet[1] from the first, and is operated to correspond with it. In bad weather, the position by day, or the color by night, must be seen by the engineer as he passes this distant signal, and there is no time for hesitation in recognizing it if danger is shown, for, if the train be moving at the rate of sixty miles an hour he will need the whole distance between the distant and home signal in which to stop his train, and there will be only fifteen seconds before it, if unchecked, will have reached the danger point, or if the speed be thirty miles an hour, the time will only be extended to thirty seconds. It is, therefore, essential not only that our railroads should be equipped with the best of signals and safety appliances, but also that the men employed in the operation of railway trains should have such acuteness of vision and color-perception that they can recognize these signals quickly and accurately, even under unfavorable conditions, and in this paper your attention is called to the methods of examination and the standards which should be employed to make sure that railway employes have a safe amount of form and color-sense.

Defects in acuteness of sight are much more common than those of color-perception. On the Burlington system in six years 344 men were rejected for defects of sight and 176 for color, and a careful examination will show not only that defects of sight greatly outnumber those of color, but also that many cases of poor vision are acquired after entering the service, thus making it necessary to have periodical re-examinations of form-vision,

[1] On many roads the distant signal is placed at from 1,000 to 2,000 feet from the home signal, on a rising grade, and 2,000 to 3,000 feet on a falling grade.

whereas, if the original tests of color-sense have been carefully made it will be found that very few cases of poor color-perception are afterward developed, unless there is an accompanying failure of form-vision, which will be discovered by a periodical re-examination of the sight.

Two standards should be required for entrance to the service, a higher for those whose work will be on the head end of a train and in other important positions, and a lower for other operating men. Again, a higher standard should be required in each of those classes for entrance to this service than will suffice for a continuance of duty after years of service. There is no injustice in requiring a high physical standard of men seeking certain kinds of work, and there is no difficulty in obtaining such men; the trouble comes when men are discharged, after years of faithful work, for defects which could have been discovered at the start, if a careful examination had been made at that time.

There is a great variation in the standards of vision required on various roads and in various countries. In Holland, where oculists of the highest standing have had charge of this matter, the rules require, for Class A (enginemen and firemen), with both eyes open, normal vision; with each eye separately, the other being covered, normal vision in one eye, and not less than one-half in the other, without glasses; also normal refraction. For Class B (station masters, conductors, brakemen, switchmen, etc.), with both eyes open, normal vision, without glasses, free from hypermetropia of more than one diopter; with each eye separately, in one eye normal vision, in the other not less than one quarter, without glasses. The vision is measured by Snellen's test types. In England a committee of the British Medical Association, after a careful investigation, recommended in their report in 1892, for Class A (engine drivers, cleaners, firemen, signalmen, and pointsmen), in one eye normal vision and refraction, in the other eye not less than one-half of normal vision, without glasses. For Class B (all other situations in the executive service concerned with the moving and signaling of trains), with both eyes open, visual acuteness of not less than two-thirds of normal without glasses, provided that neither eye has less than one-third of nor-

mal vision without glasses, using Snellen's test types. In Belgium, for Class A, in one eye 20/20, in the other not less than 20/30; for Class B, in one eye 20/20, in the other not less than 20/40. In Bavaria, for Class A, 20/40 without glasses is allowed (this class here includes all outdoor employes), and for re-examination not less than 20/40 with glasses.

On the N. Y. C. & H. R. R. R. for a first-class certificate, vision of at least 20/30 is required, but if one eye has 20/20 and the other 20/40, it will answer. For a second-class certificate, for yard service only, not less than 20/40 is required, but if one eye has 20/20 and the other 20/200, it is accepted for a second-class certificate. On the Pennsylvania system 20/20 in one eye and not less than 20/50 in the other is considered satisfactory, with or without glasses. On the Burlington system, for entrance to the engine service, 20/20 in each eye is required, and for the train and yard service, 20/20 in one eye, and not less than 20/40 in the other, without glasses in all cases, each eye being tested separately.

It will be seen from the above that the standards of required vision for the first class vary in different places from 20/20, or normal vision in each eye, down to 20/40 in each eye. In some cases provision is made for re-examination, but in many places no separate standard is required for this. The test in general use is Snellen's test letters, although in England some roads use the army test cards, with dots instead of letters. The principal objection I have found to the ordinary Snellen's letters for this work is that they are all printed on one card, and it is not difficult for men who are to be tested to provide themselves with copies of the card in order to memorize the letters. In one case a man read easily the xx line at 20 feet, who was found to have less than 20/40 vision, as he could not read either the xxx or the xl lines at 20 feet when called on to do so unexpectedly by the examiner.

In order to overcome this difficulty, and also to provide a more convenient form of test card, I had letters of Snellen's standard sizes printed on a series of separate cards, one line on each card, and for each distance had three cards with a different arrangement of letters on each. In testing a person, one of the xx foot cards is placed in a good light, twenty feet from him, and

he is asked to read it, one eye being covered. If he does so correctly, another of the xx foot cards is shown for a second trial, the other eye being covered. He cannot tell which of the cards he will be asked to read, so that even if he had memorized them all he would have to see the letters in order to read the cards correctly, and as there are no letters of a larger size on the same card he could not recite from memory the smaller letters by means of the larger ones that he could see. If he cannot read the xx foot line at 20 feet, then the xxx, xl, l, or the lxx foot letters are shown in succession, until letters are found that he can read, or if he cannot read the lxx line at 20 feet, he is brought nearer until a point is found where it can be read, or if he cannot see it at any distance the fact is so noted. This test has been in use on the Burlington system since 1893, and has given good satisfaction. I have recently been experimenting with another test card, with figures made to represent a line of semaphore signals, such as are often placed on a bridge crossing the tracks, or at the entrance to a union station. On this card the length and breadth of the arms correspond to the height and breadth of the Snellen's letters for xx feet, and also nearly correspond, when looked at from a distance of twenty feet, to the size of a standard semaphore arm when seen at a distance of half a mile. I find, when the relative visibility of this signal card is compared with the corresponding Snellen's letters, that the card of signals of the same size as the xx foot letters can be clearly seen nearly as far as the xxx foot letters, for with the signals the only point is to recognize quickly and accurately the position of the semaphore arm, as to whether it stands horizontally at danger, or at an angle with the horizon at safety; but with the letters small differences of shape must be recognized; it is very easy to confound the C. G. D. O. and some others, and such mistakes should not reject.

A railroad company should require 20/20, or normal vision in each eye without glasses, and less than two diopters of hypermetropia of all persons seeking employment in its engine service, who will be required at any time to act as engineman or fireman. After years of service the requirements may be reduced for Class A to not less than 20/30 of normal vision in one eye and 20/40

in the other with the test letters, each eye being tested separately without glasses, but less than this should not be allowed on the head end of a train. The same standard should be required for men in signal towers, in charge of interlocking signals and switches and drawbridges. For the general train and yard service, Class B, lower standards may be allowed; for entrance to this class, 20/20, or normal vision in one eye, and not less than 20/40 in the other, without glasses, should be required. After years of service, on re-examination, this might be reduced to not less than 20/30 in one eye and 20/70 in the other, without glasses. In addition to reading the test letters by candidates for employment, a simple test for refraction, which can be made by any medical examiner, should also be used in all cases. We may leave out of the question the conditions of myopia and astigmatism, for, if present in any amount, they would cause enough defect in sight to bring the vision below the required standard, but a young man of twenty-one years of age or thereabouts, may be able to read easily the xx line at 20 feet with each eye, and yet have a hypermetropia of two diopters, or more, which by the time he is forty-five years old, or sooner, will reduce his visual acuteness for distant objects below the standard required, and it is not just to such a man to accept him for the service, and then retire him when he is too old to learn another business, because he does not then come up to the visual standard required, without glasses, although he may have had normal vision in each eye when he first applied for work. Such hypermetropia can be easily detected by asking the applicant to read the xx line of test letters on another card at twenty feet while looking through a convex lens of two diopters; if with each eye he can read the letters correctly through this glass he should be rejected, for it shows he has a hypermetropia of two diopters or more. A test for refraction with the ophthalmoscope would be better than the above, but we must bear in mind that these tests must often be applied by medical men who have had no special training in ophthalmology, and with a large system of railroads like the Burlington, having more than 7,000 miles of track, it is impossible to have men brought in to central points over great distances for examination when they apply for work.

I recently had a case to examine where the vision of an engineer had been reduced to 3/10 of normal in each eye. There was no other trouble except a hypermetropia of three diopters, and with proper glasses the vision was brought up to normal in one eye and 9/10 in the other. He was transferred to other work in which he could use his glasses, but in this case the simple test with a convex glass would probably have shown the trouble at the first examination for entrance to the service.

A periodical re-examination of the form-vision should be required of all men employed in the operation of trains or signals every three years, for the sight is often impaired by disease that may show no outward change, and such re-examination should also be made before promotion, after serious illness or injury, after accidents which might have been due to defective sight, or when from excessive use of tobacco or other cause it is deemed necessary.

The certificate of examination given to the man should state the date of examination, the occupation which the certificate covers, and whether or not any defect is found in the acuteness of vision, color-perception, or hearing, and the certificate should be signed both by the examiner and the person examined.

In all examinations of sight, care should be taken to see that uniform and accurate test letters are used. Within a month my attention has been called to sets of test letters, recently published, in which there was a considerable variation in the size of the letters to be read, at 20 feet, on different cards published by the same firm. The illumination of the letters should also be clear and as constant as possible, the card being hung where it gets the daylight full upon it, but not in the sunshine or where the person reading it will have to look directly toward a strong light.

The examination blank used on the N. Y. C. & H. R. R. R. does not provide for any test for the range or field of vision, and in my experience I have never known a person to be rejected for a defect in either of these things when the acuteness of vision came up to the required standard. It is, however, well to have a reading test in order to make sure that the person examined can read both print and written train orders at the ordinary dis-

tance, and I have known an engineer who was found by this test to be unable to read, although he had normal vision, knew his letters and could sign his name; he was in the habit of getting his fireman to read all train orders to him, but when this condition was discovered he was laid off until he could learn to read, and write more than his signature.

In regard to the use of glasses, the instructions of the Pennsylvania Railroad say: "If one eye has 20/20 and the other eye not less than 20/50, with or without glasses, the sight may be considered satisfactory," but no statement is made as to whether this will be satisfactory for an examination for entrance to the service, or only for re-examination, or whether glasses will be allowed on duty. It will be found in practice that glasses for distant vision cannot be worn on duty by enginemen and others whose work requires them to be out of doors in all kinds of weather, for steam, rain, smoke, and snow interfere seriously with their use. For this reason the acuteness of distant vision for these men should always be tested without glasses. With cases of simple presbyopia it is different. Here the distant vision remains unimpaired, and when glasses are needed for occasional use, as in reading train orders, they are not incompatible with good service; the presbyopia will have to be considerable before it will interfere with the telling of time by a watch or the reading of steam or water gauges without glasses.

The standard examination for color-vision should include three things: 1, a test with colored signal-flags; 2, a test by comparison of colors by the Holmgren worsteds; 3, a test with colored lights seen through openings of regulated size, which will form small images on the central part of the retina. The acuteness of color-vision varies considerably from the normal standard, as does form-vision. We may have a feeble color-perception, an incomplete loss of color-sense, generally for red and green, or a complete loss of perception for one or both these colors, and in rare cases a complete loss of all color-perception, in which the solar spectrum looks like a gray smear of varying shade, but no color.

The object of our tests is to discover the extent and character of the defects, and whether they are sufficient in amount to dis-

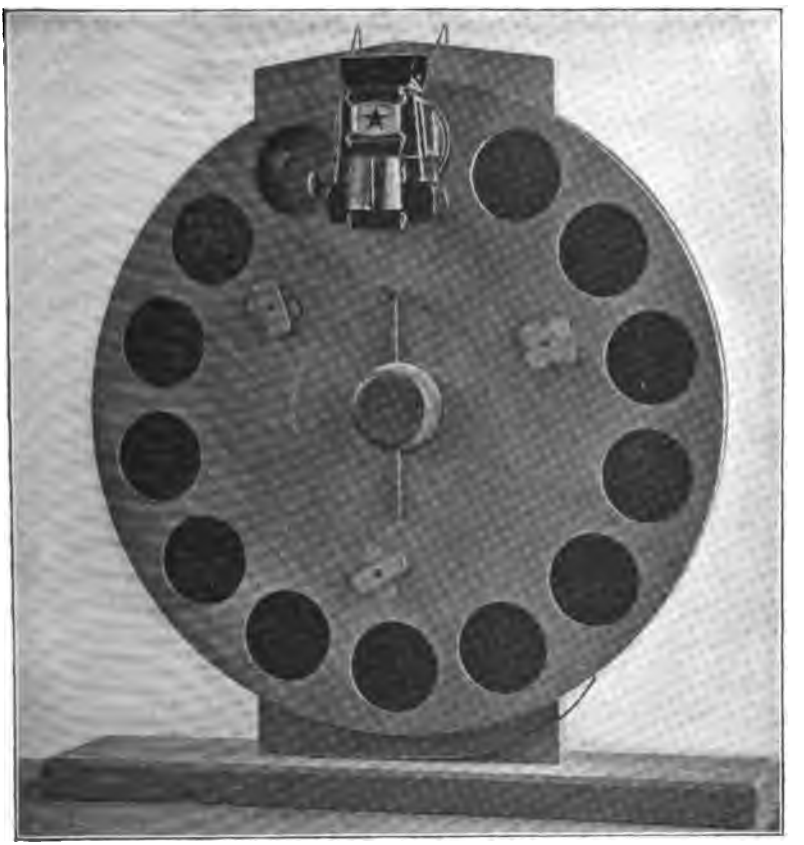


FIG. 1.

Back view of Williams' apparatus for testing color-vision, showing the position of the lantern and the discs of colored glass. The colored glasses are held in place in cells made between two wooden discs, which are clamped together and can be revolved at the back of the instrument so as to bring any glass in front of the lantern, and a spring at the lower part catches lightly in grooves on the periphery of the discs, so as to center each glass before the light. If it is desired to change the order of the glasses, or to insert new ones, the discs can be easily unclamped, and any desired change made.

qualify according to the standards adopted. The test with flags shows whether the man can give correct names to the flags, and can tell their use and meaning. It is also desirable to use one of the flags at a time as a test object, and get the applicant to pick out from the heap of Holmgren's worsteds all the colors that look like the flag. It will often be found that correct names can be given to the different flags even when the test by worsteds and colored lights show a considerable defect of color-sense, but when used as a comparison test a green may be selected among other colors as looking like a red flag, or *vice versa*. The second test, by comparison of colors without naming them, selecting from a large number those which appear to the applicant like certain test-skeins, light green or pink, according to the method proposed by Professor Holmgren, is the most satisfactory and easily applied of all the good qualitative tests, but it does not give a sufficient test for small central scotomata.

I have recently had a conductor, who passed both the Holmgren and the Thomson tests without making a single mistake, and who selected his colors without hesitation, but when examined by colored lights transmitted through small openings, or even with switch-light lenses, before a lamp at twenty feet distance, he called a red light "white" in four different cases; he had a central defect in the retina, probably caused by the use of tobacco in excess, yet the area affected was so small that the retinal image of the flag or the skein of worsted was formed partly on the diseased retina and partly on the healthy portion outside the scotoma, where the color could be easily recognized, but when the retinal image was reduced in size, as with the lights, it was formed entirely within the borders of the scotoma, and red lights were called white or sometimes green. It will not do, however, to substitute the tests with such lights for the Holmgren test, as the lights give little chance for comparison or for the selection of confusion colors, and for ordinary cases of congenital color defect it would take a long and tedious examination to reach the same result that could be arrived at more quickly by the worsted test. On the other hand the test with lights, with regulated openings, should be used in addition to the worsted test, as

was first proposed in Holland. The regulations of the Dutch railways specify that a quantitative test for color-sense be made in every case by Donder's method. In his instrument the light from a standard candle is allowed to fall on a disc carrying red, green, blue, and ground glasses, and in front of this disc is a diaphragm with openings of 1, 2, 5, 10, and 20 mm. diameter. The color can be changed by rotating the disc, and the man is requested to name the color as seen through the smallest opening when placed five metres from him; if he cannot do this he approaches the instrument until the colors can be recognized or a larger opening can be used. Professor Donders accepted the formula for acuteness of color perception as a/A, in which a is the smallest visual angle at which the person examined sees the colors, and A the smallest angle at which the examiner sees them. If the examiner can see the red and green lights through the 1 mm. opening at a distance of five meters, and the person examined only sees them at one meter, his color-perception would be one-fifth. In these cases we have to depend on the acuteness of color-sense in the eye of the examiner as the standard with which the applicant is compared, and this standard may vary considerably in different persons. Again, the distance of the candle from the colored glass is an important factor, and the red can be seen by normal eyes with the candle at a greater distance from the glass than the green. In all signal lanterns, however, the light must remain at the same distance from the lens, so in testing railway employes we may disregard this difference. Instead of taking so small an opening as 1 mm. at 5 meters distance for the standard test for transmitted light as used in Holland, it will be found better to use a 2 mm. hole, or about 5/64 of an inch, and to place the person to be examined at a distance of twenty feet from it. Under these conditions the opening will subtend a visual angle of one minute at the eye, and will correspond to the width of the letters on the xx foot Snellen test card used for that distance. If we make the other openings in our diaphragm 7/64, 9/64, 3/16, 1/4, 3/8, and 3/4 of an inch in diameter respectively, we shall have a series of diameters that will nearly correspond to the width of the series of letters on Snellen's test card, and which,

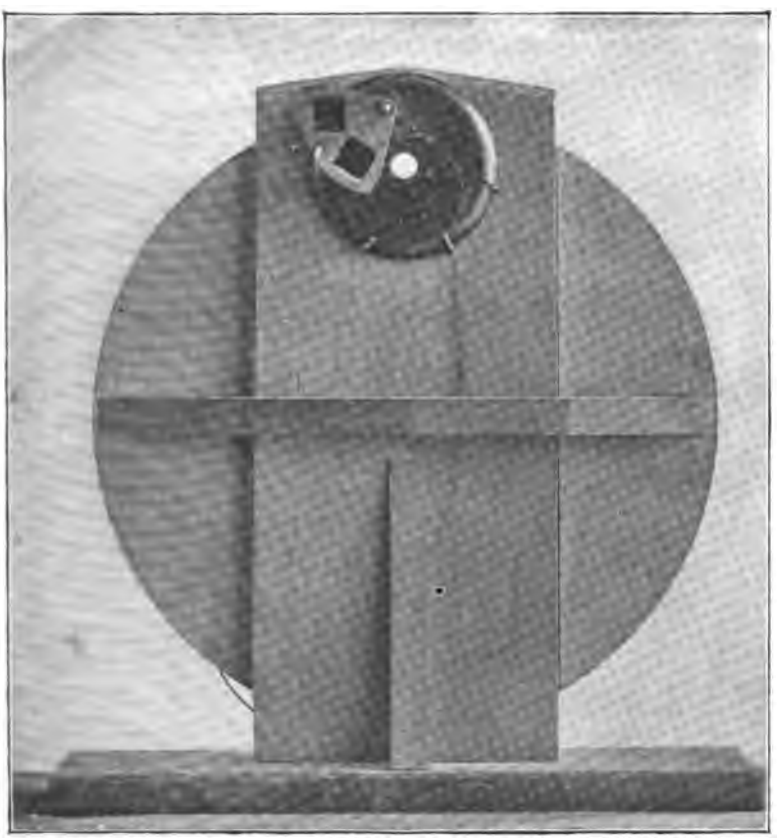


FIG. 2.

Front view, showing revolving diaphragm with graduated holes, the two London smoke glasses.

at corresponding distances, will subtend nearly the uniform angle of one minute. If we consider as a sufficient standard for this test the ability to recognize red and green, either alone or combined with London smoke glass, to vary the intensity of the light, and also white light, either alone or combined with the London smoke glass, all seen under the standard angle of one minute, we can then use the other openings in this diaphragm to give a fraction which will represent the amount of color-perception as compared with this unit, just as in the case of form-vision. For instance, if the normal eye recognizes easily the colors through the 2 mm. or 5/64-inch opening at twenty feet, and the eye examined only distinguishes them when the 9/64[1] opening is used, we call his color-perception one-half of the standard. This is not exact, and we cannot get with color-perception, by our ordinary tests, the same fine graduations of acuteness that we get with form-vision. We also find many eyes whose color-perception is more acute than this standard, just as we find eyes that can see the xx line of letters at a greater distance than twenty feet, but it furnishes us with an easy test, having direct relation to the standard of form-vision, and one which is useful in detecting defects in the central portion of the retina. About five years ago I made an instrument on this principle, which has given satisfactory results, and with it the standard switch-light lenses and semaphore glasses can also be used as confirmatory tests.

In a paper by Dr. Nuel of Liege, published in 1895, he states that in Belgium in the confirmatory test they consider the color-sense as sufficient if the applicant distinguishes red and green through an opening of 2 mm. at five meters distance from lighted by an ordinary kerosene lamp. In Holland they require for color-sense in enginemen and firemen a power of distinguishing colors with both eyes open of not less than four-fifths, or in each eye separately not less than one-half, using the 1 mm. opening as the standard, and for other specified employments a color-perception of at least three-fifths with both eyes open, or not less

[1] The sizes of the opening in this series were chosen because twist-drills of these sizes could be easily obtained, and gave holes that at the respective distances very nearly subtended the standard angle of one minute.

than one-quarter in each eye alone. For re-examination in the first class, the standard is dropped to at least three-quarters with both eyes open, or at least one-third with each separately, and in the second class, with both eyes to at least two-thirds, or, with each eye separately, to at least one-quarter, and Donder's instrument is required to be used in all these tests. I used a Donder's instrument, made by Kaagenar in Utrecht, for some time, but did not find it so convenient or satisfactory as my instrument with the larger openings and greater number and variety of glasses. Even with Holmgren's worsteds it is possible to make a distinction between some of the greater variations in color-sense, for if a person is hesitating, picks up some confusion colors and compares them with the test skein, perhaps selects them and then discards them, or picks up some of the true colors, and after comparison rejects them, finally selecting none of the confusion colors, it shows that he has a feeble color-perception; if he selects with the greens some of the confusion colors, but with the pink or rose skein makes no mistake, it shows that he has an incomplete defect; but if with the green skein he selects confusion colors in addition to the greens, and with the rose skein selects with the rose colors some blues or violets, it shows he has complete defect for red, or if with the rose skein he selects in addition to rose colors some greens or grays it shows he has complete defect for green. On the Burlington system I found it best to have each of the one hundred and seventeen colors of the Holmgren worsteds provided with a small brass numbered tag, which could be used to make a record of the numbers selected by the applicant, just as in the Thomson test, and each set of worsteds being carefully prepared in my office, the numbers and colors were uniform for the whole system, so that when the results of each examination were forwarded to me for approval they could be easily checked.

It is very necessary in this work to have a general supervision placed in the hands of some competent person, who can properly instruct the examiners, see that they carry out their directions, and make a periodical inspection of the tests they use in order to make sure they are kept in good condition, otherwise

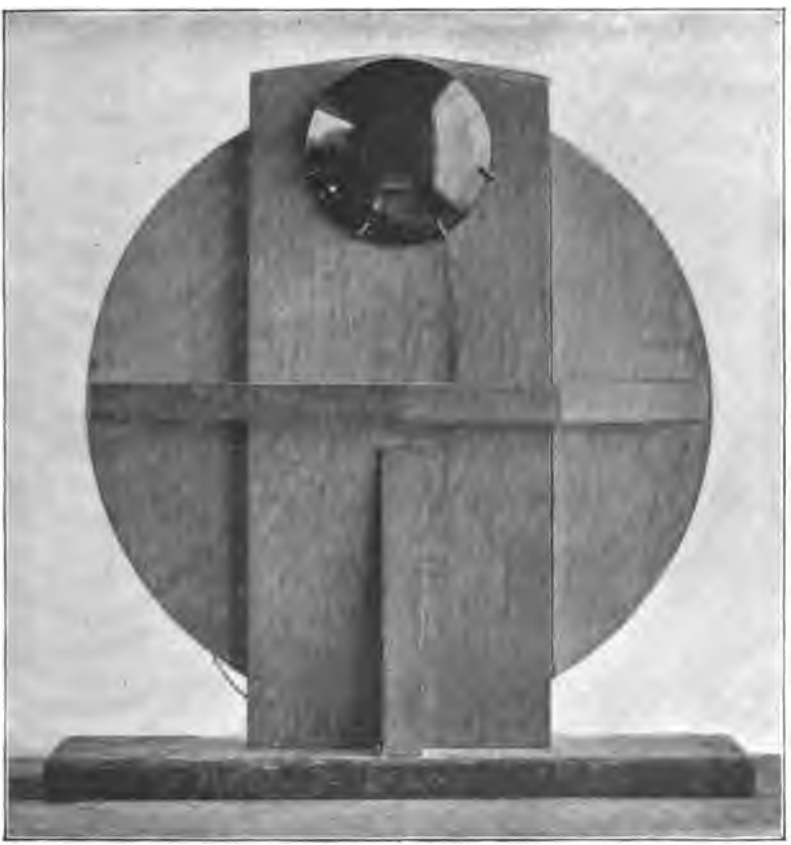


FIG. 3.

Front view with standard switch light lens in place of the diaphragm.

there is danger that the examiner will become careless, or that the test cards or colors will deteriorate so that they can no longer be relied on to give proper results; the record of all examinations should also be filed in one central office.

So long as red and green signals are used for night work (and no other colors seem better adapted to this use) no applicant should be accepted for service in a position which will require him to use such signals who has incomplete or even feeble color-vision, and if the entrance examinations have been thoroughly carried out, according to Holmgren's directions, and also with transmitted lights, there will be no need of a repetition of these color-tests, except as before stated, where the form-vision has become impaired, or where for some special reason it seems best to repeat the examination.

The tests for both form and color-vision should be made when the man is not fatigued by a long tour of duty or exposure, for it has been found that the acuteness of both form and color perception is often diminished after two hours or more of engine work. After long runs and unusual exposure this temporary reduction in acuteness may be considerable, and it furnishes an additional argument for insisting on a high standard for such service. If one-half of normal vision were to be accepted as a minimum for each eye when the person was rested and in good health, the conditions of service might easily reduce this far below the danger point, but if a high standard is required the vision may be temporarily reduced by fatigue without becoming dangerous.

In a report on the sanitary service of the railways in Holland, presented to the International Conference in Amsterdam in 1895, it is stated: "Experience has shown that since the examination for admission has been carefully made, the re-examinations have shown scarcely any incapable men. It is also to be noted that the employes themselves in general recognize the utility and importance of these examinations." In a letter from one of the officers of the Burlington system, written to me Nov. 18, 1896, he says that the operating officers of that system thoroughly approve of the examinations for entrance to their service, which include not only the tests for sight, color-sense, and hear-

ing, but also a general medical examination made by the medical examiners of the road, who are all well-qualified physicians, and he also states that the general character and efficiency of the employes have been improved by these examinations, which are fairly and thoroughly carried out. It seems to me that more can be accomplished in the way of improving the standards and methods used for testing sight, etc., by showing the operating officers of the railroads that it is for their own interest, and for the interest of their employes, to have such tests carefully made and to use such methods as shall be just and efficient, rather than by trying to force measures on the railroads through legislation, which is apt to be crude, and is met with opposition on the part of both the railroad companies and their employes, as being directed against their personal interests, whereas, proper methods rightly applied should meet with the approval of both officers and men.

In addition to the tests for the men, more care should be taken with the signals which the men are to use, especially in the case of colored lights. Captain Abney and others have shown the spectroscopic quality of various red and green signal lights, but it will be found in practice that a test based on the photometric quality of the lights is more important, especially in the case of persons with feeble color-sense, who depend largely on a difference of intensity to recognize the difference between the red and green lights. With reference to this point, they have kindly tested spectroscopically for me at the Mass. Institute of Technology three switch-light lenses, with the following results:

No of Lens.	Maximum wave length transmitted.	Minimum wave length transmitted.
No. 1.	7130	5820
2.	7150	5940
3.	7150	6260

All these lenses were flashed on their smooth surface with a red copper glass, and these figures show that they all transmitted light from about the same part of the spectrum. No. 1 was so light a red that it might easily be mistaken for white when seen at a distance. No. 3 was so dark a red that it could be mistaken

for green by a person defective in color-sense, as has actually been done with this lens. No. 2 was a standard lens of medium intensity. Nos. 1 and 3 would have been rejected by a photometric test, such as I described at a meeting of this Society in 1895, although the spectroscope did not show much difference between them, therefore some test based on the intensity of the transmitted light should be applied in accepting all red signal lenses.

SO-CALLED ACCOMMODATION IN THE LENSLESS EYE — WITH REPORT OF A CASE.

BY JOSEPH A. WHITE, A.M., M.D.,
Professor of Diseases of the Eye in the University College of Medicine,
RICHMOND, VA.

While the question of so-called accommodation in Aphakial eyes is a mooted one among leading authorities, there is no doubt but that an occasional case is met with that brings to the fore the consideration of this unsettled subject. Whether it is a species of accommodation, or a peculiar ability to interpret dispersion circles or whatever the explanation may be, there are individuals on record, who, with a lensless eye, have had the power of seeing distinctly with *the same glass* at all distances within the normal range of vision. The number of such cases, especially those subjected to the proper tests, is, of course, not very great, and I may, therefore, be pardoned in considering the one I now present as somewhat remarkable and worthy of going on record.

Case.

J. A. F., forty-five years of age, blind in the right eye with cataract, but had the left lens removed four years ago. The astigmometer showed about 2 or 2¼ D of astigmatism against the rule. His vision was 20/20 with + 12 D ⌒ + 1.5 D^{c} ax 180°, and with the same glass he read No. 1 Jaeger at 10 to 12 inches without moving the spectacles or tilting his head. At intermediate points his vision agreed with this result, *i. e.*, V. = 10/10, 6/6, etc.

With + 11 D ⌒ + 1.5 D^{c} ax 180° his vision = 20/15, and with + 13 D ⌒ 1.5 D^{c} ax 180° he could read No. 1 nearer and more sharply. The radius of corneal curvature with central fixation was in the horizontal meridian 7.30 mm., and in the vertical meridian 7.70 mm. When fixing an object at 20 feet the radius of curvature was in H. M., 7.33 mm., and in V. M., 7.75 mm. When he attempted to decipher some letters on a small disk fastened by a wire to the tube, the radius of the curvature in the H. M. was 7.20 mm., and in the V. M. 7.65 mm. That there was a change in the shape of the cornea was shown by displacement of the images on the arc.

With the eye cocainized and held open artificially, these results were the same.

As he had already conformed to one of Donder's requirements for accommodation (see Donder's "Accom. and Refract.," p. 320), that the result of the equation for vision at different intervals between near and distant points should correspond, I tried him also with the light point test, but, while agreeing in the main, his replies were somewhat unsatisfactory.

The following day the pupils were dilated ad maximum, exposing a densely clouded capsule with one small central triangular opening and one round opening in the outer and upper quadrant; this latter was covered when the pupil was contracted. The visual result was as follows:

With + 10 D ⌒ + 2.25 D^{c} + 180° V. = 20/15.

With + 13 D ⌒ + 2.25 D^{c} + 180° he could read No. 1.

With + 11 D and the cylinder he could not get 20/20; nor could he read No. 1 with any weaker glass than + 13 D added to the cylinder, showing that whatever his power of accurate vision for different distances might have been, it was considerably altered by the mydriatic; this alteration being equal to at least 3 D. The manifest astigmatism was also changed from + 1.5 D to + 2.25 D under the mydriatic.

It seemed strange that before the use of the mydriatic he obtained 20/15 with + 11 D ⌒ + 1.5 D^{c} ax 180°, while afterwards he could get the same result, only with + 10 D ⌒ + 2.25 D^{c} ax 180°. This reduction of nearly 1 D in the spherical, while

under the influence of the mydriatic seems contrary to all rules, although the increase in the strength of the cylinder in almost equal amount (in other words, the manifesting of some latent astigmatism) is in accordance with common experience. A possible explanation of this decrease in the spherical glass is that prior to the installation of the mydriatic more or less spasm of the ciliary muscle existed.

If a lens were in the eye, this would have resulted in drawing forward the choroid, relaxing the suspensory ligament, and producing an apparent refactive myopia which would have disappeared under a mydriatic. In the absence of the lens, however, the effect would be to draw forward the choroid and possibly shorten the anteroposterior axis, producing thereby slight hyperopia. When the ciliary muscle was relaxed by the mydriatic, the traction on the choroid would cease and slight elongation of the antero-posterior axis result with a consequent decrease in the strength of the lens.

With the pupils dilated, the radius of corneal curvature in the H. M. was 7.20 mm., and in the V. M. was 7.65 mm. when he attempted to fix near objects; while it was in the H. M. 7.33 mm., and in the V. M. 7.75 when looking at a distance. Here, again, the displacement of the images on the arc showed that the corneal curvature was changed.

Neither before nor after the use of the mydriatic was the alteration in the corneal curvature more than 0.75, and it was evidently produced by the action of the external muscles in the effort to accommodate for near vision. These results were the same in every examination which was repeated every day for several days.

It will be observed that the radius of curvature in the two principal meridians of the cornea were practically the same for near points, and also for distant points, both with a contracted and a dilated pupil. This does not correspond with what theoretically should have been the case when the difference in the astigmatism with and without the mydriatic is taken into consideration. I am, therefore, puzzled to account for the 0.50 or 0.75 of astigmatism which became manifest when the pupil was dilated and again became latent upon its subsequent contraction. I am

also at a loss to explain the difference in his so-called accommodation power before and after using the mydriatic, which difference amounted to three diopters. As soon as the pupil contracted this focussing power was restored. Woinow's view that this might be brought about by an alteration in the curvature of the anterior surface of the vitreous by the action of the ciliary muscle is scarcely tenable, as the effect of this muscle's action would be rather to draw the whole vitreous forward as above suggested without altering its anterior surface at all. That it is not due to the change in the cornea, according to Foerster's view, is evident from the fact that this alteration was the same both with and without the mydriatic.

If we accepted Loring's view, that the so-called accommodation in the lensless eye is explained by *individual ability to interpret dispersion circles*, we have a plausible explanation of the loss of this ability when the pupil was dilated, as the dispersion circles are thereby very much increased and consequently more difficult to interpret.

I should, however, suppose that the opaque capsule with central opening would have compensated to some extent for the dilation of the pupil in any confusion that might have arisen from the increase in size of the dispersion circles, unless the presence of the second opening caused two sets of dispersion circles overlapping each other just as monocular diplopia results from two openings of the iris. This, of course, would cause as much interference, if not more, with the power of interpretation of dispersion circles than if the pupil were perfectly free from membrane; and this may explain why this case differs from all those I am familiar with in our literature *in the apparent loss of the so-called accommodation* when under the influence of a mydriatic.

Loring's view has been very ably supported by Dr. E. A. Davis in his article on accommodation in a lensless eye, published in the Manhattan Eye and Ear Hospital reports, January, 1895. Silex, in his paper in Knapp's Archives, in 1888, drew the same conclusion. It is probably the most satisfactory explanation heretofore submitted, but why is it that so few of the multitude of cataract cases acquire this power? And is it optical or mental?

TRANSACTIONS

OF THE

AMERICAN

OPHTHALMOLOGICAL SOCIETY.

Thirty-Fourth Annual Meeting.

NEW LONDON, CONN., 1898.

HARTFORD:
PUBLISHED BY THE SOCIETY.
1898.

PRESS OF
THE CASE, LOCKWOOD & BRAINARD CO.
HARTFORD, CONN.

TABLE OF CONTENTS.

PAGE.

Members of the Society, ... 249
Minutes of the Thirty-fourth Annual Meeting, ... 253
Why the proportion of blind in cities is less than in the country. Dr. L. Howe, ... 259
Majority report of the Committee on Resolutions relating to purulent ophthalmia of infancy, ... 265
Minority report of the Committee on Resolutions relating to purulent ophthalmia of infancy, ... 268
Gunshot wounds of the eyeball. Dr. C. S. Bull, ... 275
Some unusual tumors of the orbit, eyelids, and vicinity. Dr. C. S. Bull, 281
Exostosis of the frontal sinus — enophthalmos. Dr. E. Fridenberg, . 289
Fibro-sarcoma of right orbit. Dr. F. M. Wilson, ... 291
Case of Lipoma of the orbit. Dr. E. Gruening, ... 294
Operations for secondary cataract. Dr. H. Knapp, ... 297
Buphthalmia, series of cases in the same family. Dr. W. B. Johnson, 308
Two cases of metastatic carcinoma of the choroid. Dr. G. E. de Schweinitz, ... 313
Leuco-sarcoma of the choroid — enucleation in the glaucomatous state with histological examination of the eyeball. Dr. G. E. de Schweinitz, ... 318
Angioma of the Lachrymal gland extending to the apex of the orbit; removal, with preservation of the globe, etc. Dr. G. E. de Schweinitz, ... 321
Primary carcinoma of the caruncle. Dr. G. E. de Schweinitz, . . 324
Growth in region of lachrymal sac with the histological characters of Tubercle. Dr. G. E. de Schweinitz, ... 327
Remarks on cases of High Myopia; report of one case in which both lenses were removed. Dr. H. D. Noyes, ... 330
Surgical treatment of excessive Myopia with report of an additional case. Dr. W. H. Wilmer, ... 333
Surgical treatment of excessive Myopia. Dr. R. Sattler, . . . 338
Surgical treatment of Kerato-conus. Dr. R. Sattler, ... 341
Treatment of entropion of lower lid with caustic potash. Dr. S. Theobald, ... 359
Lymphoma of the lids. Dr. M. Standish, ... 364
Case of spindle-cell Sarcoma of conjunctiva and cornea. Dr. S. B. St. John, ... 369
Case of interstitial keratitis congenital in origin. Dr. H. F. Hansell, . 371
Hypopion-keratitis. Drs. Jno. Green and A. E. Ewing, . . . 374
Spontaneous expulsion of foreign body from anterior chamber. Dr. J. P. Worrell, ... 386
Delayed union after Cataract extraction. Dr. G. C. Harlan, . . 390

PAGE.

Protargol as antiseptic prior to operations on eyeball. Dr. B. E. Fryer, ... 402
Pathology of experimental Quinine blindness. Dr. W. A. Holden, . 405
Implantation of sponge in orbit after enucleation. Dr. S. D. Risley, . 411
Position of eyeball during the Listing rotation, etc. Dr. G. Hay, . 414
Cassaripe; a new remedy for corneal ulceration. Dr. S. D. Risley, . 423
Sympathetic inflammation from adhesion of eyelid to stump. Dr. T. Y. Sutphen, ... 428
Two cases of premature delivery to preserve sight, ... 430
Unilateral Winking as a test of comparative visual acuity. Dr. W. Rider, ... 434
Case of sympathetic neuro-retinitis. Dr. J. P. Worrell, . . . 452
Removal of calcareous (siliquose) cataract. Dr. H. D. Noyes, . . 454
The Haab-Magnet as a Sideroscope. Dr. P. A. Callan, . . . 456
Learning to see at forty, first with one eye, and later with both. Dr. J. L. Minor, ... 460
Case of Melano-sarcoma of conjunctiva and cornea of long duration. Drs. Jno. Green and A. E. Ewing, ... 468
A chalazion forceps. Dr. C. J. Kipp, ... 471

MEMBERS

OF THE

American Ophthalmological Society.

1898-99.

ACTIVE MEMBERS.

The (*) indicates *Associate* Members.

NAME.	RESIDENCE.	PLACE.
Dr. F. W. ABBOT,	523 Franklin Street,	Buffalo, N. Y.
*Dr. A. E. ADAMS,	44 Grand Street,	Newburg, N. Y.
Dr. WM. F. AIKEN,	228 Oglethorpe Ave. E.	Savannah, Ga.
Dr. L. A. W. ALLEMAN,	64 Montague Street,	Brooklyn, N. Y.
*Dr. G. W. ALLYN,	515 Penn Avenue,	Pittsburg, Pa.
Dr. A. ALT,	3036 Locust Street,	St. Louis, Mo.
†Dr. J. A. ANDREWS,	107 Madison Avenue,	New York, N. Y.
Dr. S. C. AYRES,	64 West 7th Street,	Cincinnati, Ohio.
Dr. WM. T. BACON,	11 Pratt Street,	Hartford, Conn.
Dr. DAVID DEBECK,	Cor. 9th and Race Streets,	Cincinnati, Ohio.
Dr. H. W. BRADFORD,	120 Paulgore Street,	Jamaica Plain, Mass.
Dr. CHARLES S. BULL,	47 West 36th Street,	New York, N. Y.
Dr. F. BULLER,	123 Stanley Street,	Montreal, Canada.
Dr. SWAN M. BURNETT,	916 Farragut Sq. (17th St.),	Washington, D. C.
Dr. PETER A. CALLAN,	35 West 38th Street,	New York, N. Y.
Dr. F. P. CAPRON,	118 Angell Street,	Providence, R. I.
Dr. W. H. CARMALT,	87 Elm Street,	New Haven, Conn.
*Dr. JOHN T. CARPENTER, JR.,	1419 Walnut Street,	Philadelphia, Pa.
Dr. H. B. CHANDLER,	34½ Beacon Street,	Boston, Mass.
Dr. WM. CHEATHAM,	303 West Chestnut Street,	Louisville, Ky.
Dr. F. E. CHENEY,	Hotel Bristol,	Boston, Mass.
*Dr. J. H. CLAIBORNE,	39 West 36th Street,	New York City.
Dr. C. F. CLARK,	188 East State Street,	Columbus, Ohio.
*Dr. ANTON COE,	1110 F. St.,	Washington, D. C.
Dr. DAVID COGGIN,	7 Chestnut Street,	Salem, Mass.
*Dr. WM. E. COWEN,	35 E. 60th Street,	New York, N. Y.
Dr. C. M. CULVER,	36 Eagle Street,	Albany, N. Y.
Dr. W. S. DENNETT,	8 East 49th Street,	New York, N. Y.
Dr. HASKET DERBY,	182 Marlboro Street,	Boston, Mass.
Dr. RICHARD H. DERBY,	9 West 35th Street,	New York, N. Y.
Dr. LEWIS S. DIXON,	232 Clarendon Street,	Boston, Mass.
Dr. J. B. EMERSON,	20 East 30th Street,	New York, N. Y.

† Temporarily residing in Santa Barbara, Cal.

NAME.	RESIDENCE.	PLACE.
Dr. ARTHUR E. EWING,	2670 Washington Avenue,	St. Louis, Mo.
*Dr. T. H. FENTON,	1319 Spruce Street,	Philadelphia, Pa.
Dr. GEORGE F. FISKE,	100 State Street,	Chicago, Ill.
Dr. EDW. FRIDENBERG,	242 Lenox Avenue	New York, N. Y.
Dr. H. FRIEDENWALD,	1029 Madison Ave.,	Baltimore, Md.
Dr. B. F. FRYER,	Cor. 9th and Cherry Streets,	Kansas City, Mo.
*Dr. J. B. GIBSON,	215 E. Pike's Peak Ave.,	Colorado Sp'ngs, Col.
*Dr. G. M. GOULD,	119 South 17th Street,	Philadelphia, Pa.
*Dr. H. Y. GRANT,	414 Delaware Avenue,	Buffalo, N. Y.
Dr. JOHN GREEN,	2670 Washington Avenue,	St. Louis, Mo.
Dr. EMIL GRUENING,	109 East 23d Street,	New York, N. Y.
Dr. G. W. HALE,	Wilcox Building,	Nashville, Tenn.
*Dr. WM. D. HALL,	387 Boylston Street,	Boston, Mass.
Dr. H. F. HANSELL,	254 South 16th Street,	Philadelphia, Pa.
Dr. GEORGE C. HARLAN,	1515 Walnut Street,	Philadelphia, Pa.
Dr. DAVID HARROWER,	9 Elm Street,	Worcester, Mass.
*Dr. N. D. HARVEY,	360 Benefit Street,	Providence, R. I.
Dr. GUSTAVUS HAY,	383 Marlborough Street,	Boston, Mass.
Dr. NEIL J. HEPBURN,	369 West 23d Street,	New York, N. Y.
*Dr. WARD HOLDEN,	45 West 39th Street,	New York, N. Y.
Dr. E. E. HOLT,	723 Congress Street,	Portland, Me.
Dr. LUCIEN HOWE,	87 West Huron Street,	Buffalo, N. Y.
Dr. A. A. HUBBELL,	212 Franklin Street,	Buffalo, N. Y.
Dr. D. W. HUNTER,	233 Madison Avenue,	New York, N. Y.
*Dr. J. W. INGALLS,	848 Lafayette Avenue,	Brooklyn, N. Y.
*Dr. E. E. JACK,	215 Beacon Street,	Boston, Mass.
Dr. EDWARD JACKSON,	McPhee Building,	Denver, Col.
Dr. B. JOY JEFFRIES,	15 Chestnut St., Beacon Hill,	Boston, Mass.
Dr. W. B. JOHNSON,	170 Broadway,	Paterson, N. J.
Dr. CHARLES J. KIPP,	534 Broad Street,	Newark, N. J.
Dr. H. KNAPP,	26 West 40th Street,	New York, N. Y.
Dr. CARL KOLLER,	715 Madison Avenue,	New York, N. Y.
Dr. CHAS. W. KOLLOCK,	Cor. Wentworth & Com'g Sts.,	Charleston, S. C.
Dr. W. E. LAMBERT,	8 West 35th Street,	New York, N. Y.
*Dr. F. N. LEWIS,	35 W. 36th Street,	New York City.
Dr. J. A. LIPPINCOTT,,	435 Penn Avenue,	Pittsburg, Pa.
Dr. F. B. LORING,	1420 K. Street,	Washington, D. C.
Dr. F. W. MARLOW,	401 Montgomery Street,	Syracuse, N. Y.
Dr. W. V. MARMION,	1108 F. Street,	Washington, D. C.
*Dr. W. B. MARPLE,	20 W. 31st Street,	New York, N. Y.
Dr. ARTHUR MATHEWSON,	139 Montague Street,	Brooklyn, N. Y.
Dr. S. F. MCFARLAND,	76 Front Street,	Binghamton, N. Y.
Dr. CHAS. H. MCILWAINE,	50 E. 86th Street,	New York, N. Y.
Dr. R. J. MCKAY,	Cor. 9th and Market Streets,	Wilmington, Del.
Dr. C. S. MERRILL,	22 Washington Avenue,	Albany, N. Y.
Dr. B. L. MILLIKIN,	278 Prospect Street,	Cleveland, Ohio.
Dr. H. G. MILLER,	262 Benefit Street,	Providence, R. I.

NAME.	RESIDENCE.	PLACE.
Dr. J. LANCELOT MINOR,	14 Randolph Building,	Memphis, Tenn.
Dr. W. F. MITTENDORF,	140 Madison Avenue,	New York, N. Y.
Dr. WM. O. MOORE,	42 East 29th Street,	New York, N. Y.
Dr. RUSSELL MURDOCH,	418 Cathedral Street,	Baltimore, Md.
Dr. WM. F. NORRIS,	1530 Locust Street,	Philadelphia, Pa.
Dr. HENRY D. NOYES,	233 Madison Avenue,	New York, N. Y.
Dr. CHARLES A. OLIVER,	1507 Locust Street,	Philadelphia, Pa.
Dr. H. S. OPPENHEIMER,	16 E. 32d Street,	New York, N. Y.
*Dr. R. J. PHILLIPS,	4011 Chestnut Street,	Philadelphia, Pa.
Dr. THOMAS R. POOLEY,	107 Madison Avenue,	New York, N. Y.
*Dr. WILLIAM C. POSEY,	1831 Chestnut Street,	Philadelphia, Pa.
Dr. M. H. POST,	Beaum't St., cor. Wash. Av.,	St. Louis, Mo.
Dr. H. R. PRICE,	485 Franklin Avenue,	Brooklyn, N. Y.
Dr. J. S. PROUT,	26 Schermerhorn Street,	Brooklyn, N, Y.
Dr. B. ALEX'R RANDALL,	1604 Walnut Street,	Philadelphia, Pa.
Dr. R. L. RANDOLPH,	211 W. Madison Street,	Baltimore, Md.
Dr. WILLIAM RANKIN,	23 Cedar Street,	Newark, N. J.
Dr. J. M. RAY,	423 West Chestnut Street,	Louisville, Ky.
Dr. R. A. REEVE,	22 Shuter Street,	Toronto, Canada.
Dr. STEPHEN O. RICHEY,	732 17th Street,	Washington, D. C.
Dr. CHARLES E. RIDER,	53 South Fitzhugh Street,	Rochester, N. Y.
Dr. WHEELOCK RIDER,	53 South Fitzhugh Street,	Rochester, N. Y.
*Dr. H. W. RING,	46 Elm Street,	New Haven, Conn.
Dr. SAMUEL D. RISLEY,	1722 Walnut Street,	Philadelphia, Pa.
Dr. EDMUND C. RIVERS,	16th and Stout Streets,	Denver City, Col.
Dr. D. B. ST. JOHN ROOSA,	20 East 30th Street.	New York, N. Y.
Dr. JOHN D. RUSHMORE,	129 Montague Street,	Brooklyn, N. Y.
Dr. ROBERT SATTLER,	14 East 7th Street,	Cincinnati, Ohio.
*Dr. T. B. SCHNEIDEMAN,	112 South 18th Street,	Philadelphia, Pa.
Dr. G. E. DESCHWEINITZ,	1401 Locust Street,	Philadelphia, Pa.
*Dr. P. N. K. SCHWENK,	810 North 7th Street,	Philadelphia, Pa.
Dr. W. W. SEELEY,	7½ Beacon St.,	Boston, Mass.
Dr. HENRY L. SHAW,	19 Commonwealth Avenue,	Boston, Mass.
*Dr. F. D. SKEEL,	41 E. 23d Street,	New York, N. Y.
Dr. J. A. SPALDING,	627 Congress Street,	Portland, Me.
Dr. FRANCIS P. SPRAGUE,	229 Commonwealth Avenue,	Boston, Mass.
Dr. MYLES STANDISH,	6 St. James Avenue,	Boston, Mass.
Dr. GEORGE T. STEVENS,	33 West 33d Street,	New York, N. Y.
Dr. SAMUEL B. ST. JOHN,	68 Pratt St.,	Hartford, Conn.
Dr. GEO. STRAWBRIDGE,	202 So. 15th Street,	Philadelphia, Pa.
Dr. T. Y. SUTPHEN,	999 Broad Street,	Newark, N. J.
Dr. J. OSCROFT TANSLEY,	28 West 43d Street,	New York, N. Y.
Dr. LEWIS H. TAYLOR,	44 South Franklin Street,	Wilkes Barre, Pa.
Dr. SAMUEL THEOBALD,	304 West Monument Street,	Baltimore, Md.
Dr. CH. HERMON THOMAS,	1633 Locust Street,	Philadelphia, Pa.
*Dr. A. G. THOMSON,	1426 Walnut Street,	Philadelphia, Pa.
Dr. WILLIAM THOMSON,	1426 Walnut Street,	Philadelphia, Pa.

NAME.	RESIDENCE.	PLACE.
*Dr. JAS. THORINGTON,	120 South 18th Street,	Philadelphia, Pa.
Dr. JOHN VAN DUYN,	111 South Salina Street,	Syracuse, N. Y.
*Dr. C. A. VEASEY,	116 South 19th Street,	Philadelphia, Pa.
Dr. O. F. WADSWORTH,	526 Beacon Street,	Boston, Mass.
Dr. LEROY P. WALKER,	25 East 24th Street,	New York, N. P.
Dr. JAMES WALLACE,	121 North 16th Street,	Philadelphia, Pa.
Dr. DAVID WEBSTER,	327 Madison Avenue,	New York, N. Y.
Dr. J. E. WEEKS,	154 Madison Avenue,	New York, N. Y.
Dr. J. A. WHITE,,	200 E. Franklin Street,	Richmond, Va.
*Dr. W. H. WILDER,	103 State Street,	Chicago, Ill.
Dr. CHAS. H. WILLIAMS,	15 Arlington Street,	Boston, Mass.
Dr. WM. H. WILMER,	1330 N. York Ave., N. W.,	Washington, D. C.
Dr. F. M. WILSON,	288 Myrtle Avenue,	Bridgeport, Conn.
*Dr. WILLIAM L. WOOD,	412 Oregonian Building,	Portland, Oregon.
Dr. J. P. WORRELL,	20 South 7th Street,	Terre Haute, Ind.
Total, ...		141

HONORARY MEMBERS.

Dr. C. SCHWEIGGER, ...	Berlin, Prussia.
Dr. E. L. HOLMES, ...	Chicago, Ill.
Whole number, ...	143

MINUTES OF THE PROCEEDINGS.

THIRTY-FOURTH ANNUAL MEETING.

PEQUOT HOUSE,

NEW LONDON, CONN., July 20, 1898.

The Thirty-fourth Annual Meeting of the Society was called to order by the President, Dr. GEORGE C. HARLAN, at 10 A. M., and the following committees were appointed:

Committee on Bulletin — Drs. C. A. OLIVER and MYLES STANDISH.

Committee on Membership — Drs. JOHN GREEN, W. H. CARMALT, SAMUEL THEOBALD, ARTHUR MATHEWSON, and E. GRUENING.

Auditing Committee — Dr. B. E. FRYER.

The Bulletin Committee reported, and the following papers were read:

1. "Why the proportion of blind in the country is greater than in the large cities," by Dr. L. Howe.

2. Majority Report from the Committee appointed at the last meeting to report on the advisability of the Society endorsing legislation on the subject of the compulsory use of Silver Nitrate in Ophthalmia Neonatorum, was read by Dr. Howe. (Signed also by Dr. Burnett.)

3. Minority Report from the same Committee, by Dr. Jackson, was read by the Secretary. The resolutions offered last year, amended so as to make them apply only to almshouses, were adopted.

4. "Gunshot wounds of the eye and orbit," by Dr. C. S. Bull. Discussed by Drs. Gruening and Bull.

5. "Some unusual tumors of the eye and orbit," by Dr. C. S. Bull. Discussed by Drs. Knapp, Pooley, Carmalt, and Johnson.

6. "Osteoma of the orbit, with euophthalmos," by Dr. E. Fridenberg.

7. "Abscess, involving the frontal sinus, with destruction of the vault of the orbit and depression of the eyeball," by Dr. C. F. Clark.

Drs. C. D. Wolcott, Chicago, Percy Fridenberg, and J. R. Goffe of New York, T. A. Peck of Norwich, Conn., were invited to attend the sessions and take part in the discussions.

8. "Large Tumor of orbit (fibro-sarcoma) of 23 years' standing — removal — photographs and specimen," by Dr. F. M. Wilson. Discussed by Drs. Pooley and Wilson.

9. "Lipoma of the orbit," by Dr. Gruening. Discussed by Drs. Bull, Holden, de Schweinitz, and Knapp.

10. "Treatment of eutropion of the lower lid with caustic potash," by Dr. Theobald. Discussed by Drs. Knapp, Abbot, Theobald, Gruening, Noyes, Wilson, Prout, and Risley.

11. "Lymphoma of Lids," by Dr. Standish. Discussed by Drs. Jack, Standish, and de Schweinitz.

12. "A case of spindle-celled sarcoma, involving conjunctiva and cornea; removal of growth without impairment of sight," by Dr. St. John.

13. "Conjunctival melano-sarcoma, involving the cornea," by Dr. Green.

14. "Case of interstitial keratitis congenital in origin," by Dr. Hansell.

15. "Hypopion-keratitis — break in Descemet's membrane," by Dr. Green. Discussed by Drs. Holden and Green.

16. "New treatment of ulcers and other infectious diseases of the eye by Cassareep," by Dr. Risley. Discussed by Drs. Green, Standish, Johnson, Jack, and Risley.

Adjourned to 3 P. M.

Called to order at 3.10.

17. "On the position of the eyeball during the Listing Rotation, as compared, on the one hand, with the successive positions of a plane passing through the respective line of sight, and, on the other, with the successive positions of the plane of sight, these two planes changing their positions in the eyeball, as the particular Listing Rotation proceeds, and this change explaining the apparent inconsistency between the Donders Inclination and the Helmholtz Rotation," by Dr. Hay.

18. "Spontaneous expulsion of foreign body from the anterior chamber," by Dr. Worrell. Discussed by Dr. Hansell.

19. "Some of the earlier symptoms of senile cataract," by Dr. Mittendorf. Discussed by Drs. Kipp, Mittendorf, Clark, and Risley.

20. "Operations for secondary cataract," by Dr. Knapp. Discussed by Drs. Roosa, Noyes, Kipp, Callan, Clark, Howe, Pooley, Wadsworth, Knapp, and Howe.

21. "Delayed union in cataract extraction," by Dr. Harlan. Discussed by Drs. Noyes, Gruening, Johnson, Standish, and Knapp.

Adjourned to executive session at 8 P. M.

Society then went into executive session.

The Committee on Membership reported favorably on eight of the names referred to them, in addition to the three favorably reported by the Committee of last year. These candidates were then voted upon, and were all elected. They are as follows: Dr. James Thorington, Philadelphia; Dr. Jno. T. Carpenter, Jr., Philadelphia; Dr. Wm. C. Posey, Philadelphia; Dr. Clarence A. Veasey, Philadelphia; Dr. Wm. L. Wood, Portland, Oregon; Dr. A. G. Thomson, Philadelphia; Dr. J. H. Claiborne, New York; Dr. T. B. Schneidemann, Philadelphia; Dr. Anton Coe, Washington, D. C.; Dr. J. W. Ingalls, Brooklyn, N. Y.; Dr. F. N. Lewis, New York city. The Committee also offered a list of candidates which it recommended should be referred to the Committee of Membership for next year. So ordered.

The Treasurer's report was read, and, having been indorsed by the Auditing Committee as correct, was accepted and ordered on file. The resignation of Dr. Holmes of Chicago was received, and Dr. Holmes was elected an honorary member. The resignation of Dr. Jones of Chicago was also received.

The Nominating Committee reported the following list of officers for the ensuing year, who were elected:

President, Dr. O. F. WADSWORTH.

Vice-President, Dr. C. S. BULL.

Corresponding Secretary, Dr. J. S. PROUT.

Recording Secretary and Treasurer, Dr. S. B. ST. JOHN.

Publication Committee, Drs. W. S. DENNETT, R. H. DERBY, and S. B. ST. JOHN.

Voted, That the next place of meeting be New London.

Voted, That the assessment of next year be ten dollars.

Dr. J. D. Rushmore was elected Delegate and Dr. Bull alternate, to the executive committee of the American Congress of Physicians and Surgeons for 1900.

JULY 21st.

Called to order at 9.45.

22. "Protargol in the antiseptic preparation of the conjunctiva prior to cutting operations on the eyeball," by Dr. Fryer.

23. "Buphthalmia — an interesting series of cases occurring in the same family," by Dr. Johnson. Discussed by Drs. Prout and Harlan.

24. "A contribution to the Pathology of the eye and its appendages, including cases and microscopical examinations of sarcoma of the choroid, metastatic carcinoma of the choroid, angio-adenoma of the lachrymal gland. Primary sarcoma of the caruncle and a pre-lachrymal tuberculous growth," by Dr. de Schweinitz. Discussed by Drs. Fryer and Bull.

25. "The surgical treatment of conical cornea," by Dr. Sattler.

26. "The surgical treatment of excessive degrees of myopia," by Dr. Sattler. Discussed by Drs. Mittendorf, Kipp, Knapp,

Pooley, Theobald, Sutphen, Noyes, Gruening, Sattler, Bull, Roosa, Risley, Thomson, Wilmer, Taylor, deSchweinitz, Standish, and Wadsworth.

27. "Remarks on High Myopia, treatment of one case by removal of the lens," by Dr. Noyes.

28. "Contribution to the operative treatment of High Myopia, with an additional case," by Dr. Wilmer. Discussed by Drs. Noyes, Clark, and Wilmer.

29. "Case of sympathetic inflammation from adhesion of the eyelid to stump of eyeball (recovery)," by Dr. Sutphen.

30. "The pathology of experimental quinine amblyopia," by Dr. Holden. Discussed by Drs. de Schweinitz and Holden.

31. "Two cases of premature delivery to preserve sight," by Dr. Adams.

32. "Case of sympathetic neuro-retinitis (recovery)," by Dr. Worrell.

33. "Insertion of sponge after enucleation," by Dr. Risley. Discussed by Dr. Harlan.

34. "Unilateral winking as a test of comparative visual acuity," by Dr. W. Rider (by title).

35. "The Haab magnet as a sideroscope," by Dr. Callan (by title).

36. "Learning to see first with one eye and later with both at forty years of age," by Dr. Minor (by title).

37. "Removal of calcareous (siliquose) cataract," by Dr. Noyes.

38. "A chalazion forceps," by Dr. Kipp.

Adjourned.

S. B. ST. JOHN, *Secretary.*

Members present at the thirty-fourth annual meeting of the American Ophthalmological Society:

Dr. S. B. St. John,	H. D. Noyes,
Myles Standish,	F. M. Wilson,
Arthur Mathewson,	E. Gruening,
Wheelock Rider,	T. R. Pooley,

John Green,
G. W. Allyn,
G. W. Hale,
B. E. Fryer,
F. W. Abbott,
G. C. Harlan,
W. B. Marple,
W. B. Johnson,
C. S. Bull,
L. A. W. Alleman,
W. D. Hall,
A. E. Adams,
E. Fridenburg,
J. D. Rushmore,
J. O. Minor,
D. Harrower, Jr.,
C. J. Kipp,
Wm. Thomson,
W. E. Lambert,
W. H. Carmalt,
P. A. Callan,
A. A. Hubbell,
O. F. Wadsworth,
G. E. de Schweinitz,
W. T. Bacon,
F. P. Capron,
S. D. Risley,
H. Knapp,
C. E. Rider,
Harry Friedenwald,
T. H. Fenton,
W. A. Holden,
P. N. K. Schwenk,
H. F. Hansell,
C. F. Clark,
E. E. Jack,
W. H. Wilmer,
L. S. Dixon,
H. S. Oppenheimer,
S. Theobald,
J. S. Prout,
G. Hay,
W. F. Mittendorf,
J. P. Worrell,
T. Y. Sutphen,
C. W. Culver,
H. R. Price,
R. Sattler,
D. B. St. J. Roosa,
H. W. Ring,
L. W. Taylor,
E. E. Holt,
L. Howe,
F. W. Marlow.

WHY THE PROPORTION OF BLIND IN CITIES IS LESS THAN IN THE COUNTRY.

BY LUCIEN HOWE, M.D.,
BUFFALO, N. Y.

It is rather a surprising fact that the number of blind in the large centers of population in this country is relatively smaller than the number in the whole state in which the given city is situated. In order to show this at a glance, a table has been constructed, which contains in the first column the twenty-five largest cities arranged according to population. In the second column is shown the relative proportion of blind per million in these cities, and in the county in which each is located, and in the third column, the proportion of blind in the entire state. The reason for selecting the population of the county, and not that of the city alone, is that in some instances, like Boston, for example, the city proper includes a comparatively small part of the thickly-settled region. In the next column the proportion of blind is given per million not only in order to state the ratio more exactly than by the percentage, but also to have this column correspond with similar columns given in the United States census reports for each state. Of these twenty-five largest cities in the United States, there were only two in which the number of blind in the city is larger than in the state, and in one of these the difference is exceedingly small. Or, taking all of the cities of over fifty thousand inhabitants together, we find in them almost 33 per cent. less of blind than in the average of the entire country. A similar relation has been found to exist in Russia between the blind population in the cities and in the country. Having thus shown the fact, let us next inquire what causative factors are fixed and what ones, by varying, may account for this difference. The various causes of blindness are naturally divided into those which are (1) Congenital or (2) Acquired, the latter being subdivided into causes due to traumatism, to general diseases, and to local diseases. The first class can, of course, be left out of

account. As for traumatism and general diseases there is every reason to conclude that these would be more potent in the cities, where factories and like industries are numerous, and the general results of crowd poison more serious, of course, than in the country.

City.	In County.	In State.
New York,	496	732
Chicago, Ill.,	313	741
Philadelphia, Pa.,	780	747
Brooklyn, N. Y.,	332	732
St. Louis, Mo.,	495	917
Boston, Mass.,	645	824
Baltimore, Md.,	754	786
San Francisco, Cal.,	561	645
Cincinnati, O.,	675	918
Cleveland, O.,	479	918
Buffalo, N. Y.,	532	732
New Orleans, La.,	999	766
Pittsburgh, Pa.,	494	747
Washington, D. C.,	789	799
Detroit, Mich.,	474	776
Milwaukee, Wis.,	432	725
Newark, N. J.,	409	581
Minneapolis, Minn.,	393	493
Jersey City, N. J.,	421	581
Louisville, Ky.,	811	1,063
Omaha, Neb.,	177	536
Rochester, N. Y.,	516	732
St. Paul, Minn.,	250	493
Kansas City, Mo.,	635	917
Providence, R. I.,	772	889

It remains only to consider the local diseases. These are likewise equally common to city and country — except the contagious forms which, of course, can be more rapidly spread in large workshops and residential schools than from one farm to another. But this factor, like the one before, although against the city, is probably balanced about equally by the means afforded for obtaining prompt relief from these, or all other diseases of the eye, that is, by the abundance of physicians and even the superabundance of hospitals and infirmaries, and also by the ready access to them by good roads or by transportation by steam or electricity.

Thus, as we consider the different eye diseases in turn we find the conditions in regard to each practically the same, or about equally balanced, between city and country, until we come to one disease which in this connection is all important. That is ophthalmia of infancy. Long ago I suspected, as most others have, that more care was taken to prevent this disease by the use of the silver nitrate solution, or other prophylaxis, by the average well-equipped city doctor, no matter in what social stratum his practice might be, than was taken on the average by his brother in the country, who is necessarily hampered by greater inconveniences and difficulties. Especially did it seem probable that the gain or loss would be great in almshouses or lying-in institutions, where any variation in the amount of care in this respect would also, in the aggregate, have great and far-reaching effects. Therefore, with the hope of obtaining some data on this point more or less reliable, last year I sent a letter to the physicians in charge of county almshouses in New York state, hoping to learn what was the habitual procedure of these practitioners. With other questions, the letters asked the number of births during the previous year, in about what percentage of cases the Credé method was used, and what percentage of the children developed ophthalmia of infancy. To these letters forty-seven replies were received. In thirty-eight of these almshouses children had been born the year before. In only seven of these institutions was the silver nitrate solution used as prescribed by Credé, and three of these seven were from counties belonging to cities of over 30,000 inhabitants. In other words, such prophylaxis was used in only three out of thirty-four county almshouses in the rural districts. It is fair to assume that this represented the average opinion and the habitual practice in those counties and in others in that state and elsewhere. Now, on the other hand, desiring to learn the opinion and habitual practice of obstetricians in at least one large city, a similar letter was sent to members of the New York Obstetrical Society, asking, among other questions, whether it was considered that the silver nitrate solutions should be always used in public institutions, and also whether

it should be made obligatory there. Replies were received from thirty-five members. Twenty-eight of these advocated its invariable use in public institutions, and twenty-two of them thought that it should be made obligatory there. It is fair to assume again that this represented the average medical opinion and habitual practice in that city and in others in that state and elsewhere. It is also proper to note that this opinion of obstetricians relates to "public institutions" of any kind, and it is quite probable, if asked whether or not the so-called Credé method should be made obligatory in almshouses only, there would be not simply this large majority to advocate it, but they would be almost unanimous in doing so.

These thirty-eight attending physicians of county almshouses on the one hand, and thirty-five obstetricians on the other, might alone serve to indicate the rather different views and methods of the two classes of practitioners. But it is possible to approximate a little nearer to the frequency with which the silver nitrate solution is used in the city as compared with the country, by noting what the practice is in general hospitals and similar institutions which are not county almshouses.

In order to ascertain this, a letter of inquiry was sent to these institutions in New York state, with the same questions, so far as concerned the use of silver nitrate, as to the almshouses. Among the replies received, in thirty-five of these institutions children had been born the previous year, in thirteen the Credé method was invariably used, in four it was used with some modifications, in five it was used in suspicious cases, in thirteen the average number of births was three, and in none of these had the silver nitrate been used.

Considerable space might be devoted to the analysis of these figures, small though they be, but for our present purpose it is sufficient to state the general rule, which is, that silver nitrate is used as recommended by Credé in the larger institutions in the large cities, and this and other methods of prophylaxis omitted in the smaller ones. In the first class given above are most of the metropolitan lying-in hospitals, such, for example, as the Sloane, Maternity, the Lying-in Hospital, Bellevue, and others of that

class, whereas the thirteen at the other end of the list include for the most part small institutions in small cities or the larger towns. It might almost be said that the regularity and care with which the Credé method is used is in direct ratio to the number of births in the institutions. All of these data, with others, have been already referred to elsewhere, and are still in the process of elaboration.

I am painfully aware that the figures are too small from even a single state to serve as a basis for any valuable calculation. But I do think that any one who studies them carefully will conclude that, in general, a decided difference does exist between the practice of obstetricians in the cities and these physicians in charge of county almshouses. And what is true of one state is probably true of others.

In order to appreciate the very great effect produced by even a slight but habitual variation of this factor, it is necessary to recall briefly the well-established data in regard to such prophylaxis and to the frequency of the disease itself. The evidence in regard to the effect of solutions of silver nitrate and of other methods of prophylaxis has been gradually collected, during nearly twenty years, as published from the combined experience of different obstetricians in different countries, until now there are accurate records of over fifty-four thousand births, among these the silver nitrate solution having been used over twenty-four thousand times. These data not only show, as has been frequently pointed out, that the silver nitrate solution is the best, taken altogether, that is thus far known, but that without it the percentage of cases of ophthalmia is about fourteen times as great as when no precaution is taken. Now it is also equally well known that this disease produces, with possibly a single exception, more blindness than does any other; evidently, therefore, any tendency to neglect this precaution or some other equally effective, in the country as compared with the city, would tend to multiply the victims of the disease much more rapidly in one locality than in the other. To recapitulate, the points to which attention is called are:

First: Blindness is more frequent in the country than in the cities.

Second: On examining the different factors in the production of blindness we find that these are either the same or made practically the same in city and country with one exception. That exception is ophthalmia of infancy.

Third: A comparison of statements made by thirty-eight county almshouses and by thirty-five obstetricians in the most populous state in the Union indicates that decidedly less attention is given to guarding against ophthalmia of infancy especially is the silver nitrate used less as a prophylactic in the country than in the cities.

Fourth: This tendency, on the one hand to habitual neglect, or, on the other, to the habitual use of such prophylaxis, is not only the most apparent cause of such variation — if, indeed, any other reasonable cause can be discovered — but it probably accounts for the larger part of this difference in the distribution of the blind.

If that proposition is warranted — and it seems to be — the corollary from it is important, as it indicates what might be done if this prophylaxis or some other one equally effective were universally used. As the cities of 50,000 inhabitants and upward in this country show an aggregate of 6,272 blind persons, and as this number is, as before stated, about 33 per cent. below the average for the whole country, it follows that if the same care were universal, the number in the country districts also could be reduced by 33 per cent. This would mean a total saving of not simply hundreds, but at least a few thousand from blindness. It is beyond the scope of this paper to refer to the question of legislation to enforce proper prophylaxis. As far as private practice is concerned, parents will insist upon their own methods, as they have a right to do, in a free country. But as to children in almshouses, who are specially the wards of the state, who must be supported by the state if they become helpless, and for whom it is the duty of the state to obtain the best treatment known, it does seem that we, as ophthalmologists, should join with the ex-

pert obstetricians, so large a proportion of whom apparently believe that the Credé method should be made obligatory in public institutions.

Or, if it appears a dangerous precedent to advocate any one method of treatment, no matter how excellent that may be, it is at least possible to advocate this, with some other equally effective prophylactic which may be found in the future, and thus avert to some extent this wanton and continued destruction of vision.

REPORT OF THE MAJORITY OF THE COMMITTEE ON RESOLUTIONS RELATING TO PURULENT OPHTHALMIA OF INFANCY.

The undersigned, members of the committee appointed to consider the resolutions presented at the last meeting of the society in regard to ophthalmia of infancy, respectfully report that they have carefully considered the reasons for and against the endorsement of these resolutions, and as the course taken by this society concerning them is deemed important for good or evil, we desire to place on record the reasons for the conclusion reached. In order to present these reasons as briefly as possible, each statement, not self-evident, is accompanied by a foot-note referring to the supporting evidence. The reasons are as follows:

First: The facts are sufficiently urgent to demand some such action by this society.

On the basis of calculation established by well known data (1) it is safe to say that out of about fifty thousand blind persons in the United States (2) a little over five thousand have lost their sight from ophthalmia of infancy. The minimum cost (3) each year for these persons — deduction being made for the self-supporting — (4) is over six hundred and twenty-five thousand dollars.

On the other hand, reliable data (5) published by obstetricians

in different countries, including a total of over fifty-four thousand recorded births, in more than twenty-four thousand of which the two per cent. silver nitrate solution was used, show that by the invariable use of this prophylactic method, it would be possible to reduce the number of blind in this country from this disease, in a single generation, to about three hundred and thirty or three hundred and fifty cases, with a corresponding reduction in the public cost.

In spite of this, and in spite of numerous publications on the subject (6) and other efforts to educate the profession, extending over nearly twenty years, the fact is that many obstetricians, especially in the rural districts, habitually neglect this or any other similar form of prophylaxis.

It therefore seems proper, that we, the ophthalmologists, who most frequently see the results of that neglect, and who profit by it, should thus enter some formal protest against it, such as is expressed in the first of the two resolutions under consideration.

Moreover, as the records of over seventeen thousand births in various public institutions give an average of over 9 per cent. of ophthalmia of infancy (7), and as many such children are wards of the state, to be supported through life by the state if they become helpless, the state, as the lawful guardian, has the right to dictate how they shall be treated; and if any one form of treatment has been demonstrated to be better than all other forms thus far known, it becomes the right and duty of the state to insist that such children shall have the benefit of that best treatment, just as the state also insists upon vaccination for the prevention of small-pox.

Therefore, it seems proper that this society should encourage legislation which would protect especially pauper children, and, in doing so, which would affect only physicians who are negligent or ignorant; provided, that when approving the use of the silver nitrate solution, we also approve, as the second resolution specifies, of any equally safe and efficient method whereby the loss of vision from this disease would be lessened. Thus do the facts seem sufficient to demand some such action.

Second: The endorsement of these resolutions could do no harm. The literature shows this method of prophylaxis to be remarkably free from results dangerous to vision (8), and although mistakes may occur by this or any other method of treatment, still the loss of vision would be much greater without its use than by all such possible mistakes.

Third: Some good would surely result from a formal expression of this kind by the society. If our influence were sufficient to save only a single child from blindness, it would be our evident duty to take the trouble to adopt some such resolution, or if, by the omission to do so, further neglect were encouraged, and one more child were thus made blind, the responsibility for that blindness would be ours.

Fourth: It is probable that the indirect effect of such an opinion, formally expressed, would be as potent for the saving of vision as any other action ever taken by this Society.

Fifth: There is a good precedent for such action. The Ophthalmological Society of the United Kingdom has passed resolutions whose object was to lessen blindness from ophthalmia of infancy. (9) The subject has also been favorably considered by the Societe Francaise d'Ophthalmologie (10) and by one or two general medical societies.

In consideration of the foregoing, the two members of the committee who make this report are personally of the opinion that the society would make no mistake by adopting the resolutions in the form in which they were presented last year.

But, as the third member of the committee cannot concur in this opinion — like others, perhaps, in the society — and as it is undoubtedly desirable to rid the resolutions of any intent, even implied, of restricting the action of the obstetricians in private practice, therefore we would recommend that in this second resolution the words " in almshouses " be inserted after the word " method." The second resolution would then read as follows:

Resolved, That we approve of legislation which would result in the invariable use of this method in almshouses, or of any other equally safe and efficient, whereby the loss of vision from this disease would be lessened.

With this alteration we respectfully recommend the adoption of the preamble and resolutions.

SWAN M. BURNETT,
LUCIEN HOWE.

(1) Dr. Hugo Magnus in Die Blindheit ihre Enstehung und ihre Verhütung, page 170.

(2) Report on the Insane, Feeble-minded, Deaf and Dumb, and Blind in the United States at the Eleventh Census: 1890, page 127.

(3) Report of the Trustees of the New York Institution for the Blind, 1896, page 8.

(4) Prof. William B. Wait, Sixtieth Annual Report of the Managers of the New York Institution for the Blind for the year ending September 30, 1895, page 20.

(5) Kostling, Archives fur Gynokologie, 1897.

(6) L. A. W. Alleman, The Prevention of Blindness from Ophthalmia Neonatorum.

Dr. H. Gifford, Legislation for the Prevention of Blindness.

Dr. A. A. Hubbell, A Plea for the General Use of Measures to Prevent Ophthalmia Neonatorum.

Dr. Walter B. Johnson, Present Status of Legislation, etc.

Dr. Charles W. Kollock, The Necessity of Legislation for the Prevention of Blindness in South Carolina.

Dr. J. A. Lippincott, Our Institutions as Sources of Impairment of Vision.

Dr. Charles H. May, The Prevention and Treatment of Ophthalmia Neonatorum, and the Necessity for more Efficient Legislation to Prevent Blindness from this Cause.

Dr. Hiram Woods, Blindness in the United States.

(7) Article by Kostling above cited.

(8) Dr. Hermann Cohn, Ueber Verbreitung and Verhutung der Augeneiterung der Neugeborenen.

(9) Ophthalmological Society of the United Kingdom, June, 1884. Vol. 2, page 33.

(10) Société Francaise d'Ophthalmologie, Volume XIV, page 25.

MINORITY REPORT (read by the Secretary in the absence of Dr. Jackson.)

It is desired not to underestimate the dangers of ophthalmia neonatorum, and not to undervalue the important service rendered to humanity by Dr. Howe, Dr. Burnett, and others, in calling attention to them. In two important respects, however, the above preamble and resolutions should, in the writer's judgment, be modified.

Before the American Ophthalmological Society promulgates a broad statement, its truth should be established beyond question. If it endorses a proposition for legislative compulsion, that proposition should be well considered, definite, and practical.

The truth of the statement that "purulent ophthalmia of infancy produces more blindness than any other disease" is not established. It is probably not true of the United States. It appears to be based upon the statistics of Magnus, which are not sufficiently extensive to establish a point in which they are not confirmed by other reliable statistics, and which are gathered entirely from German sources. Ophthalmia neonatorum, and the blindness resulting from it, are so directly dependent on social conditions and customs that it is not proper to draw from German statistics inferences regarding the disease in this country.

The following statistics indicate the relative frequency of the disease in Germany and the United States. Cohn, among 70,174 cases of eye disease at Wiesbaden, encountered 735 cases of ophthalmia neonatorum, or 1 in 95. The service of the Brooklyn Eye and Ear Hospital for twenty-five years, among 85,364 cases of eye disease, shows 414 cases of ophthalmia neonatorum, or 1 to 206. Combined statistics from the Massachusetts Charitable Eye and Ear Infirmary, and the Carney Hospital of Boston, the New Amsterdam Eye and Ear Hospital, and the Ophthalmic and Aural Institute of New York, the Buffalo Eye and Ear Infirmary, the Newark Charitable Eye and Ear Infirmary, the Paterson Eye and Ear Infirmary, and the Eye, Ear, Nose, and Throat Hospital of New Orleans, show among 93,744 cases of eye disease 441 of ophthalmia neonatorum, or 1 in 213, while in 193,633 cases of eye disease at Wills's Eye Hospital, Philadelphia, there were 683 cases of this form of ophthalmia, or 1 in 283. Combining all the above American statistics, we find in 382,741 cases of eye disease, 1,538 of ophthalmia neonatorum, or 1 in 249, against 1 in 95 of Cohn's statistics. So much for the relative frequency of the disease in this country.

Regarding the relative frequency of blindness caused by it, we have no published statistics that represent the frequency of

different causes of blindness in this country so well as do those of Magnus the causes of blindness in Germany. The best seem to be those contained in the paper on "The Blind of New York City," read by H. S. Oppenheimer before this society in 1891. They are of less value in this connection because 60 per cent. of the cases were foreign-born. Magnus found that ophthalmia neonatorum caused nearly 10.9 per cent. of all cases of blindness, more than any other one cause. Oppenheimer found that among his 573 cases, 35 or 6.1 per cent. were due to this disease, while 8 per cent. were due to sympathetic ophthalmia, 8.7 per cent. to explosions, 10.8 per cent. to other direct injuries to the eye, 10.8 per cent. to glaucoma, 11.3 per cent. to cataract operations, and 16.1 per cent. to blenorrhœa other than that of the newborn.

The statistics of Hansell and Bell (*Archives of Ophthalmology*, Jan., 1892) include 81 cases of binocular blindness. They do not refer to ophthalmia neonatorum in the list of causes, but all the cases of adherent leucoma and anterior staphyloma amount to 6.2 per cent., while traumatism caused 8.6 per cent., glaucoma 14.8 per cent., and optic atrophy 25.9 per cent.

The statistics of the German blind asylums show 30 per cent. of their inmates blind from ophthalmia neonatorum. (Magnus.) George C. Harlan reported (*American Journal of the Medical Sciences*, April, 1873) the causes of 167 cases of blindness seen in the Pennsylvania Institution for the Instruction of the Blind. Fifty-five cases (32.9 per cent.) were due to "purulent ophthalmia," about which he says "more than half of the cases are of the form occurring in infants (ophthalmia neonatorum)." That is, 17 per cent. or more were due to this disease. Last year F. S. Pearce, in a "Study of the Blind" based on 180 cases in the same institution, referring to the causation of the blindness, says (*Trans. Coll. of Physicians of Phila.*, 1897, p. 219): "We have not gone into this subject further than to note that ophthalmia neonatorum is a less frequent cause of the eye conditions in those admitted at the present day than in 1873."

Hasket Derby (*Boston Medical and Surgical Journal*, Oct. 17, 1889) reports on 183 cases examined in the Perkins Institution

for the Blind. The blindness had followed ophthalmia neonatorum in 34 cases, or 18.6 per cent.

The above statistics are not sufficient to show how frequent blindness from ophthalmia neonatorum is in the United States, but they do show the unreliability of inferences regarding that frequency drawn from statistics "made in Germany."

The second point to which it is desired to call attention is the indefinite and impractical character of the proposition embodied in the second resolution. If the society desires to urge legislation compelling the dropping of a 2 per cent. solution of silver nitrate in the eyes of every infant at birth, let it state just that. But it has no right to pass a resolution that may be taken to mean that, or may fairly be taken to mean something totally different.

Let it be remembered, too, that in a free country compulsory legislation covering new ground is certain to arouse opposition, and unless fully supported by intelligent public opinion is more than likely to hinder the cause it was meant to help.

The author of the resolutions, in the paper submitted in advocacy and explanation of them, says: "It is not contended here that this treatment should be enforced invariably in private practice, however strong the reasons for that may be, but some reasons are given why, in all institutions supported by public funds, this should be made obligatory, either by general state law or by local regulations." But these reasons are not valid unless it is shown that for lack of such regulations a considerable number of cases of blindness are now being caused in such institutions by ophthalmia neonatorum, and this has not been shown. In the paper just quoted but one American obstetrician is referred to, and he is quoted as using the Credé method without compulsory legislation, and having no cases of ophthalmia neonatorum among 351 deliveries. It is not enough to show that blindness has been caused in Germany, or years ago, before the subject was understood. We want to know to what extent it now occurs in the lying-in institutions of the United States.

In the writer's experience cases of blindness from ophthalmia neonatorum or its sequels have rarely or never come from lying-

in institutions. He has, therefore, inquired regarding the disease in the chief institutions of the kind in Philadelphia.

Dr. Joseph Price reports in 1,400 deliveries under his care at the Preston Retreat three cases of ophthalmia neonatorum, of which he says: "All delivered before toilet could be made, one in the street, one in the hall, and one in the bath, all mild, yielded to treatment without injury to vision."

Dr. Richard C. Norris, who succeeded Dr. Price at the Preston Retreat, has seen in 1,056 deliveries six cases of ophthalmia neonatorum, all of which completely recovered.

Dr. George M. Boyd and Dr. W. Reynolds Wilson kindly inquired into the matter at the Philadelphia Lying-in Charity; and Dr. Boyd informs the writer that in the last 2,500 deliveries in that institution in only one case was the sight injured, and in that case the injury was limited to one eye.

Here are 4,956 deliveries (802 of them treated by the Credé method) without a single case of blindness. Does such a record justify the enactment of laws taking from the surgeons in charge of such institutions their prerogative, their duty, their right to decide what treatment is best for their patients? If any record does exist that would justify such legislation, either in the recent history of such institutions or in the case-books of ophthalmic surgeons or ophthalmic clinics, let it be produced and studied. Then we may know whether to ask for legislation, and can consider what should be its character and scope.

Meanwhile, the society might resolve that it would do certain things that are more needed to-day than legislation, and are necessary preliminaries to effective legislation; and surely the resolutions of the Society will have as much weight with its own members as they would with members of any legislature. Let each member (1st) note the circumstances of each case of blindness from ophthalmia neonatorum, whether attended by physician or midwife, in public or private practice; (2d) ascertain the relative frequency of the disease, and of blindness from it in his own experience; and (3d) do all he can to direct the attention of physicians and the community to the danger of blindness from this cause, and the efficient means for its prophylaxis.

Let those who have opportunity ascertain the real proportion of cases of blindness that are due to this disease in the United States.

Let some one in each state that has a law with reference to ophthalmia neonatorum report on the working of that law, the number of prosecutions under it, the machinery which renders it effective, or the defects that nullify it.

Let a committee confer with the proper authorities to ensure that the next census shall include more valuable statistics regarding the causation of blindness.

Briefly, a study of the subject shows: That there are no sufficient data regarding the frequency of blindness caused by ophthalmia neonatorum in this country. That the statistics of other countries, especially Germany, in regard to this subject are of doubtful value, or positively misleading. That the American Ophthalmological Society can do most to prevent such blindness by the accumulation and dissemination of exact knowledge regarding it, through the efforts of its individual members and the perfecting of the methods of the census bureau.

Respectfully submitted,

EDWARD JACKSON.

Dr. HOWE. — I only wish to refer to one or two points made by Dr. Jackson. Although the law we now have in most states is very defective, I noticed that in one institution, after a midwife had been prosecuted for violation of that law, we had, within two months, more cases than had been seen in two years before. So the mere fact of attention having been called to the law would seem to be one reason for cases appearing at the hospitals. Until we had some statement from the obstetricians, the objection was well taken, but since we now have from twenty-two of the best of them in one state, the statement that they wish this preventive treatment made obligatory, I think the question is disposed of.

The immediate effect of the application of the new law proposed for almshouses would, of course, be slight. We have no right to say to those physicians, any more than to any other practitioner, you shall use this or that particular remedy. If, how-

ever, we secure a law to this effect, to become operative, say two years after enactment, then the incoming physicians in these institutions would know when entering what their duties would be. I think it would do at least some good directly, but the indirect effect would be enormous. The average physician in general practice many times does not dare to use this treatment. When he tries to use it the parents ask, "What is that for," and the father probably objects, saying the eyes look all right. If the obstetrician could point to its obligatory use in state institutions, to show that it prevents the danger, it would be accepted, and so the indirect effect from its use in almshouses will be beneficial by instructing the public.

DR. PROUT. — When I see a case of ophthalmia neonatorum I almost feel as if I was not entitled to charge for a service that has been rendered necessary by the neglect of a brother practitioner. I think that if we could reach the general practitioner to give him some instruction and induce him to use this preventive treatment we might accomplish a great deal.

DR. J. C. KIPP. — I would favor the adoption of the majority report, because it has now limited the application to almshouses, and no harm can be done by giving it a trial there. The reports have discussed the matter so fully that I think we need no further discussion, so I would move the previous question.

The resolutions as amended, so as to apply only to almshouses, were then adopted.

The following are the resolutions relating to ophthalmia of infancy as amended and adopted by the Society:

WHEREAS, Purulent Ophthalmia of Infancy produces more blindness than any other disease, thus necessitating great and often unnecessary cost to the state, with lifelong misery to the individual, and

WHEREAS, A two per cent. solution of silver nitrate dropped into the eyes of children as soon as possible after birth, is one of the most efficient means of preventing that disease, therefore,

Resolved, That we desire to call the attention of obstetricians to the fact that these cases are unfortunately common in our practice, and to urge the more frequent use of the silver nitrate solution in the manner described by Credé.

Resolved, That we approve of legislation which would result in the invariable use of this method in almshouses, or any other equally safe and efficient, whereby the loss of vision from this disease would be lessened.

GUNSHOT WOUND OF THE EYEBALL.

BY CHARLES STEDMAN BULL, M.D.,

NEW YORK CITY.

Gunshot Wound of Right Eye.

On November 9, 1895, a gentleman, aged 37, came to my office with the following story: Four days before, while shooting quail with a party of friends, he was shot in the neck, face, and right eye by one of the party, from a distance of about sixty feet. He received three shots in the neck, one just over the parotid gland, one in the temple, and at least one in the eye. He lost the sight of the right eye at once, and everything appeared of a red color with this eye. The shot in the neck and temple were removed within half an hour after the accident, and he was carried home and cold applications made to the eye. When I saw him there was an excoriation involving the external canthus, a laceration of the conjunctiva of the globe in the infero-temporal quadrant, and a perforation at the sclero-corneal margin in the same region. The anterior chamber was filled with blood, tension was increased, and he complained of constant pain in the eyeball. There was but little chemosis of the conjunctiva and no swelling of the lids. There was a moderate amount of subconjunctival hemorrhage. He was placed on his back in bed, a mixture of atropine and cocaine was instilled, and cold compresses were ordered to be applied and constantly changed. In the course of twenty-four hours the pain was much relieved, and on the second day the absorption of the blood in the anterior chamber began. On the fifth day the blood was entirely absorbed, the iris was widely dilated, and adherent to the wound at the sclero-corneal margin, and at the bottom of the anterior chamber was a small black body, which was thought to be the shot. On the tenth day all signs of irritation had subsided, and I decided to attempt the removal of the shot. The original

wound was reopened and enlarged in the direction of the foreign body. A probe was passed and the latter discovered to be metallic.

A small platinum probe was then hammered out thin and flat at the end, carefully introduced through the wound and passed behind and beyond the shot, and then by pressing the end of the flattened probe against the cornea and slowly withdrawing it, the shot was removed without the slightest difficulty. An attempt was then made to replace the prolapsed iris, but this proved impossible, and it was carefully excised, leaving a coloboma downwards and outwards. There was no reaction following the operation, the wound healed promptly under atropine and a bandage, and two weeks later the vision on being tested proved to be 20/30.

The patient has been seen a number of times since, the last occasion being about four months ago, when the vision was the same and the lens was perfectly intact.

Gunshot Wound of Left Eye.

Mr. H., aged 51, was first seen November 12, 1896, and gave the following history: Two days before he was accidentally shot obliquely in the face by a charge of No. 12 shot, at a distance of about thirty feet. Two shot struck him on the left side of the forehead, one at the outer angle of the left upper lid, and one about the middle of the left upper lid, which did not penetrate the thickness of the lid. These shot were all removed from beneath the skin at the time. He immediately complained of severe pain in the eye, which has continued ever since. When I saw him there was a very extensive subcutaneous and subconjunctival hemorrhage with bruising of the conjunctiva and eyeball, there was a clot in the anterior chamber, the iris was discolored, the pupil was distorted, and the vitreous was full of blood. There was no reflex from the fundus, tension + 1, there was perception of light, intense photophobia, and severe pain. Owing to the extensive subconjunctival hemorrhage, it was impossible to tell whether a shot had entered the eyeball, and any prolonged ex-

amination was to be avoided at this time on account of the severe pain. Cold applications were constantly made, and a solution of atropine and cocaine was instilled every hour. In twenty-four hours the blood was absorbed from the anterior chamber, the iris dilated *ad maximum*, and he could distinguish the movements of the hand in the temporal half of the field. The pain had diminished, but there was considerable conjunctival chemosis.

November 14, '96. No severe pain. Swelling of lids and conjunctiva less. Subjective photopsia still present. Nasal half of field absent. V. = 1/200 in temporal half of field. Nasal half of fundus visible. Floating clots in vitreous. Globe very sensitive to the touch.

November 15, '96. Vitreous still clearer, but no reflex from fundus on temporal side, general bruised sensation much less marked.

November 17th. Vitreous more cloudy. On outer aspect of eyeball, just above upper margin of the external rectus, near the equatorial region, was a slight elevation, as of a small shot embedded in the sclera. T. — 1.

November 19th. Vitreous still more opaque with reflex only from extreme nasal periphery of fundus. Probably a fresh hemorrhage.

November 21st. Conjunctival chemosis increased. Appearance of a shot on external aspect almost certain. An attempt was made to remove it under cocaine, by a meridional incision through the conjunctiva. As soon as the conjunctiva was incised, a bead of black vitreous protruded, but no shot was found. One shot had evidently penetrated the eyeball, and no attempt was made to find it.

From this time the unfavorable symptoms rapidly subsided, and by December 7th there was no external evidence of the injury. The left eye became perfectly quiet, with no superficial or deep injection, and clear media. There were at times attacks of very severe tri-facial neuralgia, always beginning in the eye. The tension was normal. Vision was reduced to counting

fingers in the infero-temporal quadrant of the field. On January 15, '97, all local applications were discontinued, but quinine and strychnine were given for the neuralgic attacks. The retina was detached outwards and downwards, and slightly upwards, over about three-fifths of its extent. After the effects of the atropia had passed away, the iris reacted to the stimuli of light and convergence, but remained somewhat discolored. All photophobia disappeared. He was enabled to use the other eye for all purposes by February 4th, without any evidence of fatigue or subjective photopsia.

The eye remained unchanged until October 20th, when on examining him for distance and reading glasses, the lens of the left eye was seen to be growing opaque. At the last examination, made June 10, '98, the lens was entirely opaque and presented the usual milky appearance of a soft cataract. The right eye has remained intact throughout.

Gunshot Wound of Left Eye.

Mr. J. M., aged 38, was first seen by me on December 13, 1896, and gave the following history: About two weeks before, while shooting in a patch of woods with two friends, he was shot in the left eye by one of his friends, at a distance of about forty feet, and lost the sight of this eye immediately. Four small shot, of the size of No. 12, were picked out of the skin of the face, and two from the scalp just above the line of the hair. There were three wounds of the lids, one in the upper lid and two in the lower lid. The eyeball was bloodshot, and there was a small hole in the sclera on the temporal aspect of the globe. When I saw him the lids were somewhat swollen, and the upper lid drooped. The subconjunctival hemorrhage had nearly disappeared, being most marked at the line of insertion of the external rectus muscle, where there was a slight cicatricial projection. There were two shot in the lower lid, just beneath the skin, which were readily removed. One shot could be felt embedded in the upper lid, and on everting the lid it was found just beneath the conjunctiva, near the upper margin of the tarsus, and was readily

removed through a slight transverse incision. The cornea was uninjured and transparent and the aqueous humor clear. The iris was discolored, was moderately dilated and did not respond to the stimulus of light. There was no sign of injury to the globe except the cicatrix over the insertion of the external rectus. There was no reflex from the fundus and no detail of the vitreous could be made out, but the lens was clear. The scar at the point of entrance of the shot was very thin and at the center was so black as to simulate the appearance of the shot. It was reopened by a slight incision, but no shot was found, and the vitreous and black pigment immediately presented. The wound was closed with a single scleral suture under all antiseptic precautions, a solution of atropine was instilled, and the eye was bandaged. There was no reaction. After a week had elapsed the bandage was permanently removed, and the eye treated simply by cold bathing and atropine. All swelling soon disappeared from the lids, the partial ptosis receded, and the eyeball became white like the other. In about five weeks after the injury, the patient could count fingers in the temporal half of the field, the infiltration in the vitreous became gradually absorbed and some of the details of the fundus could be distinguished. At the end of the tenth week after the accident, the vitreous had become entirely clear, and every detail of the fundus could be seen. There was no sign of the shot, but at a point on the nasal side of the fundus, very near the margin of the disc, was an atrophic patch, about half of the diameter of the disc, with a depression through the sclera, where the shot had probably passed through the posterior wall of the eye into the orbit. The disc was very pale, but otherwise normal. The retina was detached downwards and outwards, but firmly adherent apparently at the site of the external wound on the temporal side. The lens was entirely clear, and there was an eccentric vision of 10/70.

The right eye was normal and has remained so ever since. This patient has been seen at intervals of about a month ever since, and at the last visit, on June 16th, the vision of the left eye was 10/50 — eccentrically, and the appearance of the fundus was

about the same, the retinal detachment not having increased in extent, and the lens still remained clear.

Pistol-Shot Wound of Left Eye.

Mr. D. W., aged 43, was accidentally shot in the left eye on April 17, 1897, and I saw him within a few hours after the injury. The weapon used was a small Smith & Wesson revolver, and was fired at a distance of eight feet from the patient and to the left side. The bullet struck him just at the outer canthus, passed through the sclera and cornea almost tangentially, smashed both nasal bones and passed out on the other side, and was subsequently found on the floor of the room. When I saw him there was extensive laceration of both lids at the external canthus, laceration of the ocular conjunctiva, a groove entirely through the sclera from the equatorial region to the corneal margin in the temporal quadrant, and nearly the entire cornea was torn away, leaving only a small portion above still attached to the sclera. The iris was in shreds and the vitreous full of blood. After careful cleansing of the parts with bichloride solution, the lens was found dislocated downwards and backwards into the vitreous, which protruded from the open anterior segment of the eye. The patient was still suffering from the shock of the accident, and after removing some fragments of the fractured nasal bones, the parts were bandaged and the patient made comfortable. The family was told that the eye was destroyed, and enucleation was advised as soon as the patient was able to bear it. This was done on the third day, and in the usual manner, and at the same time the nasal bones were elevated, all small fragments removed, and a small plastic operation done to bring the skin over the bridge of the nose in place, and also at the external canthus. The patient did very well, and all the wounds healed with satisfactory rapidity. An excellent cavity for the insertion of an artificial eye resulted. The patient was very carefully watched for several months, but the right eye remained intact throughout in all its functions, and may now be considered entirely out of danger.

On examining the enucleated globe, the wound of the bullet was found to involve the sclera, choroid, ciliary body and ora serrata, and zonule. The lens though dislocated was not ruptured, and the capsule was not injured.

DISCUSSION.

DR. EMIL GRUENING. — The cases reported by Dr. Bull are not gunshot wounds, but wounds of the eye by shot; the only gunshot wound of the eye that he had really behaved quite differently from the others, and removal of the stump became necessary. I was very much interested in his method of procedure. Dr. Bull thought it necessary to incise in two cases in which he did not find the shot. I think that in the search for the shot an incision through the sclera is not necessary. We do not gain much by it, and do not find the shot, especially when the vitreous is not transparent; the cicatrix is generally black, and we imagine we shall find the shot there, which is usually not the case. At any rate, the shot is aseptic and eyes are very rarely infected.

DR. BULL. — There was no search made for the shot in either case; we thought the shot presented and the conjunctiva was incised, but there was no incision through the sclera in either case.

DR. GRUENING. — I understood Dr. Bull to say that the vitreous presented.

DR. BULL. — I did, but the sclera had been injured by the wound, and when the conjunctiva was incised the vitreous presented, but the sclera was not opened by the operator.

SOME UNUSUAL TUMORS OF THE ORBIT, EYELIDS, AND VICINITY.

BY CHARLES STEDMAN BULL, M.D.,

NEW YORK CITY.

Cysticercus Cyst of the Lower Lid.

The patient was a boy, aged six years, by name Joseph Gavino, born in New York of Italian parents, and was first seen by me at

the Eye Infirmary on February 14, 1897. There was a small tumor in the subcutaneous cellular tissue, just below the lower lid on the right side, about the size of a small filbert. The skin was of normal appearance and freely movable over the tumor. The skin was smooth, non-lobulated, painless and elastic, and looked like an ordinary fatty tumor, which was the diagnosis made. The eyes were normal, and there was no other abnormality about the child. The tumor had been noticed about three months and had never occasioned any inconvenience. It was removed without the slightest difficulty by an incision about half an inch long, and was shelled out of its bed like a pea out of a pod. Two stitches closed the wound, which healed completely in twenty-four hours.

The entire history of the case centers in the microscopical examination, kindly made for me by Dr. George S. Dixon, one of the pathologists to the Infirmary, who reports as follows: At first glance the tumor appeared to be an echinococcus cyst, but more prolonged and careful study gave evidence in favor of its being a cysticercus cyst. The scolex was single. The hooklets were perfectly formed, and corresponded in size and number more nearly to cysticercus cellulosae. The suction discs were more prominent than is usual in echinococcus. The original diagnosis of echinococcus was based more particularly on the character of the lining membrane of the cyst, which suggested the formation of daughter cysts. Owing to the confusion which exists among helminthologists as to the early cysticercus stages of both taenia solium and taenia echinococcus, it is difficult sometimes to reach a definite conclusion. (This case is accompanied by a micro-photograph.)

Fibro-Lipoma of the Accessory Lachrymal Gland.

The patient was a boy, aged 6, named Moses Levin, whom I first saw at the Eye Infirmary on October 13, 1897. The father, who came with the patient, stated that he had first noticed a small lump on the outside of the eye near the external angle eighteen months before, and another small lump on the corneal margin

No. 1.
[illegible] showing hooklets.

No. 2.
Portion of cyst-wall showing lining membrane.

downwards and inwards. The first lump slowly increased and extended backwards along the eyeball. On examination the latter was seen to hug the left eye closely in the supero-temporal region, was about as large as a lima bean, flattened and colorless. The small growth on the corneal margin closely resembled an ordinary dermoid tumor, and a diagnosis was therefore made of dermoid tumor of eyeball and orbit. The eye was normal in every respect. The tumor on the temporal aspect was removed through a conjunctival incision without much difficulty, the conjunctiva being carefully dissected away from it. The only firm point of adhesion found was at the upper and outer angle of the orbit. The cavity left by its removal was then carefully washed out and examined, but nothing abnormal was found. The conjunctiva was then carefully brought over the exposed sclera and the incision closed by three sutures. The wound healed without suppuration and the patient was discharged on the fourth day.

The tumor was given to Dr. Weeks, the pathologist of the Infirmary, who reported that it was a fibro-lipoma of the accessory lachrymal gland.

Dermoid Tumor of Eyeball, Complicated with an Intra-Ocular Growth.

The patient was a female infant, who when first seen, January 18, 1897, was one month old, and, according to the mother's statement, was born with the existing condition of the eye. It was the mother's first confinement and the labor was natural. The inner half of the cornea of the right eye was opaque and thickened. There was a small dermoid tumor of the eyeball in the infero-nasal quadrant, from which grew several hairs. The lower conjunctival cul-de-sac and the inner end of the lower lid were densely infiltrated and very pale, and felt like brawn. The appearance was that of amyloid infiltration. The lens was clear and the portion of the fundus which was visible seemed normal. The iris was dilated and did not react to light. There was neither conjunctival nor ciliary injection, nor any sign of irritation or pain, and the child seemed to be in excellent physical condition.

Between January 18th and March 10th there was a considerable increase in the size of the apparent dermoid tumor, and on the latter date an intra-ocular growth was made out downwards and inwards. By the end of March two apparent staphylomata or protrusions appeared in the equatorial region, one inwards and one directly downwards, and the sclera was very thin over them. At this time the anterior chamber was abolished, the iris lying directly against the cornea. Tension was now + 1, but there were no signs of irritation. The parents were advised to have the eye enucleated, but refused the operation. The left eye remained healthy throughout the entire period of observation. The child remained well all through the summer of 1897, but in November last the appearance of the eye had very much altered. The staphylomatous protrusions were now enormous and seemed on the point of rupture. The pupil was blocked by the intra-ocular growth, and the tension had still further increased. Sometime in December the inferior protrusion ruptured and a mass of slightly pigmented material protruded. A portion of this was excised and examined microscopically. It proved to consist mainly of numerous small round cells, with short fusiform cells and finely granular matter, with a few blood vessels, the latter having a wall made up of a single layer of endothelial cells. The outer half of the cornea still remained transparent, and there was no change in the appearance of the small extra-ocular dermoid growth. The child was seen again in January, and, although pale and anaemic, seemed well. The protrusion of the intra-ocular growth had increased and the whole globe seemed more prominent. Since then the child has not been seen.

Tubercle of the Eyeball.

The patient was a female child, aged 3 years, who was first seen by me at the Eye Infirmary on February 24, 1896. There was almost no history with the case, and the only fact which was elicited from the parents was that the left eye had been red and inflamed more or less constantly for about a year. The mother was a robust Italian woman, but the father was undersized, thin

and sickly in appearance. The child was the youngest of five children, all the others being apparently healthy. The patient has always been delicate, had some bowel trouble as a young infant, which lasted a long time, and has from time to time returned. The child has never walked, and speaks very little and unintelligibly, lies in a semi-stupor, but can easily be roused, and frets very little. There was marked conjunctival and ciliary injection, and considerable chemosis of the ocular conjunctiva, but no swelling of the lids. The cornea was slightly hazy, but the lens and vitreous were clear. There was a yellowish reflex from the fundus, which had been noticed for several weeks. There was a staphylomatous projection in the ciliary region, and another in the equatorial region on the nasal side. The eye was divergent, apparently entirely blind, and the tension was —2. The right eye was healthy. A diagnosis was at first made of glioma retinae, and the parents were told that the eye must be enucleated at once, in order to save the life of the child. The marked marasmic condition of the patient aroused the suspicions of possible tuberculosis, and this was rather confirmed by the appearance of the father and by the fact that two members of his family had died of chronic pulmonary trouble, presumably tuberculosis. The father had at times a chronic cough with profuse expectoration.

The eye was enucleated on March 11th, and the child recovered promptly from the anaesthetic. The specimen was turned over to Dr. Weeks, the pathologist of the Infirmary, who reports as follows:

The globe measured 23.5 mm. in antero-posterior diameter, 24 mm. in transverse diameter, and 23 mm. in vertical diameter. The cornea measured 10 mm. vertically and 11 mm. transversely. The globe was of irregular shape with marked protrusion on the nasal side anterior to the equator and 4 mm. from the corneal margin. The cornea was of normal thickness and extent. The sclera was apparently ruptured at the site above described. The anterior chamber was filled with blood clot and exudation. The iris was thickened and adherent to lens capsule, and a portion

was apparently absent. The lens was of normal size. Retina detached and disorganized. Choroid greatly thickened and only traceable over part of its extent. Interior of vitreous chamber occupied by a relatively firm grayish mass.

Microscopically, the cornea was infiltrated with small cells. In the sclera the connective tissue bundles were separated by an infiltration of small cells. At the region corresponding with staphylomatous protrusions the sclera was wanting. Anterior chamber filled with old blood clots and blood pigment, partly broken down blood corpuscles and fibrinous masses. Iris densely infiltrated with small cells and covered by an inflammatory pseudo-membrane on both surfaces. The lens was intact. Retina completely disorganized. Choroid and ciliary body greatly thickened by presence of large numbers of small cells resembling leucocytes. A few of the large vessels can still be recognized. In some parts of the eye all traces of choroid have disappeared. The mass of tissue which fills the vitreous chamber and protrudes through the opening in the sclera is composed largely of leucocytes, short fusiform cells, fibrin, granular detritus and giant cells. Nodular masses are scattered here and there throughout this tissue, which have the structure of tubercle; the cells being more or less concentrically arranged at the periphery, giant cells are present, and there is often some granular detritus at the center of the nodules. There are but few blood vessels. No tubercle bacilli were found, but, nevertheless, the new-formed tissue is in all probability tuberculous.

The patient remained in about the same condition for between four and five months, and then died of what was said to be abdominal tuberculosis.

Tumor of Eyelids, Orbit, and Neighboring Cavities of Traumatic Origin.

This case was brought to me from a distant city, and is interesting because of its rarity. The patient was a little boy, aged three years, whom I first saw November 1, 1896. The parents stated that the child had always enjoyed robust health,

and had had as yet none of the usual illnesses of childhood. In the preceding June, while playing about the yard, he had run against a gate post, and struck the left side of his face and left eye a violent blow. There was no laceration of the skin, but extensive bruising and subconjunctival ecchymosis. The eye remained red and inflamed for about two weeks, and then slowly grew better, and nothing abnormal was noticed in the child's appearance until the last of September, more than three months after the accident. Then the eye began to protrude and became limited in motility, and the lids seemed stiff and could not be closed over the globe. When I saw the child the exophthalmos was very marked, the protrusion being forwards and outwards, and the eye was almost immovable. The lids only partially covered the globe, but presented nothing abnormal. A distinct tumor could be felt on the nasal side of the orbit, as far back as the finger could reach. The media were clear and the iris reacted promptly to light, but the ophthalmoscope showed a papillitis with hemorrhages.

The parents were told that there was a tumor in the orbit, that the case was a very grave one, and that the eye and contents of the orbit should be removed at once. After consultation they consented to the operation, and the eye was enucleated. A growth was found filling the entire apex of the orbit and extending along the roof and inner wall. The entire contents of the orbit, including the lachrymal gland and periosteum, were carefully and thoroughly removed, and as there was very free oozing from the bone, the orbit was tamponned with styptic aseptic cotton. The child recovered promptly from the operation, and was sent home in two weeks. Early in January, 1897, the growth returned on the inner wall of the orbit, and on the 14th the second operation was done on the orbit and all apparent diseased tissue was removed. At that time the neighboring cavities did not seem to be involved, and the apex of the orbit looked healthy. The child did very well for nearly two months, and then the disease again showed itself in the apex of the orbit, and the lids became infiltrated and swollen. By the middle of April the

whole orbit was filled, both lids were enormously swollen and densely infiltrated, and the infiltration extended in a nodular manner upon the forehead and down upon the cheek. I declined further operative interference, not only because of the rapid extension of the growth, but because the child showed a distinctly cachectic appearance and was much emaciated. The little patient lived to the end of July and died apparently from exhaustion, there being no head symptoms up to the end.

These cases of malignant disease in children, apparently originating in traumatism, are not common. The eyeball, on microscopic examination, showed the usual signs of a papillitis, but there was no trace of malignant cellular infiltration found anywhere in the globe or optic nerve. The tumor of the orbit was a myxo-sarcoma, the bulk of the growth consisting of small round cells, while the lids and nodules on the forehead and cheek, examined after death, proved to be sarcoma, of the small-cell variety. At the autopsy the growth was found in the ethmoid cells, the sphenoid antrum, and the sphenoidal and spheno-palatine fissures, and the upper nasal meatus. The temporal and frontal bones were also extensively involved in the disease.

DISCUSSION.

DR. H. KNAPP. — I want to say a word about the last case. The doctor stated that they were very rare. That is my experience, too, but I remember two cases where the origin from trauma was not problematic, but followed the injury at once. The swelling became hard and developed into true sarcoma. It was removed, but extended in just the same way, and both children died.

DR. T. R. POOLEY. — May I say a word about the symptoms of negative and positive quality in tuberculosis? I operated for the removal of a tumor of the orbit which I supposed was a sarcoma developing in the upper outer part of the orbit. After removal it proved to be a tuberculous tumor of the lachrymal gland. Notwithstanding that, so far as we can trace the history of the patient, there was absolutely no history of tuberculosis, and the patient was one of the strongest, healthiest looking German women I ever saw. Although the operation was done many years ago there has been no return.

BEFORE OPERATION.

AFTER OPERATION.

DR. W. H. CARMALT. — Dr. Bull made use of an expression that does not hold good in regard to bone tumors of other parts of the body, viz.: that sarcoma following injury to the bones of the orbit is rare. In regard to other bones, we consider that sarcoma not infrequently follows trauma; this is certainly true in regard to fractures. The history of general surgery is very positive in that direction, but I have not looked up the literature with special reference to the bones of the orbit, and while Dr. Bull is undoubtedly correct in his statement, the exception is worth noting.

DR. W. B. JOHNSON. — I think these cases of sarcoma of the bone following traumatism are only frequent as related to tumors of the bone in other localities, and not as related to tumors in general, of malignant character. I had a case the counterpart of Dr. Bull's which I reported to this society, I think, a year or two ago, in which the nose, frontal sinus, antrum, and ethmoidal sinuses were all involved in the disease, which resulted from a blow received while entering a gate, and the removal of the superior maxillary bone and tumor was made. The child recovered from the operation, but died two months afterwards from extension of the disease through the ethmoidal sinuses to the cerebral cavity. It is a question what to do with these cases. I reported several cases at the Pan-American Medical Congress in which operation was performed, and I think they were more comfortable than were other cases which had gone on until death without operation. There is also the remote possibility of the tumor failing to return, which helps to make such operations justifiable.

EXOSTOSIS OF THE FRONTAL SINUS — ENOPHTHALMOS.

BY EDWARD FRIDENBERG, M.D.,
NEW YORK CITY.

Professor Dolbeau of Paris was the first surgeon to successfully remove by operation an orbital osteoma having its origin in the frontal sinus. His patient, operated in 1867, recovered after a slight attack of meningitis. Knapp in 1880 removed a similar growth by the method of subperiosteal enucleation without any

untoward symptoms. Since that time quite a number of cases have been published in which these osseous tumors have been extirpated, and the danger of erysipelas, meningitis, or cerebral abscess, from which all cases treated by purely operative measures, previous to Dolbeau's, had perished, seems to be in great part obviated.

The improved prognosis of the operation for exostosis of the frontal sinus is due principally to early operation, thorough antisepsis or asepsis, and finally to the fact that we have learned not to attack the tumor itself, but to chisel away the bone, usually the anterior wall of the frontal sinus, holding and confining it.

The case which I present has two features of interest: (1) The position of the tumor, which was located much more toward the temporal aspect of the orbit than usual, the mass of the osteoma being about at the center of the upper orbital margin. (2) The position of the eye, which was crowded backward into the orbit and slightly downwards. In other words, there was enophthalmos instead of the customary exophthalmos.

The patient, R. I., a Scotchman, aged 28, was first seen in August, 1893. He stated that at the age of fourteen he was often "joked" by his friends because his left eye was a trifle smaller than the right. He had always had better vision in the right eye, the difference increasing markedly of late years. Nine years ago he noticed a swelling at the upper margin of the left orbit, which has grown slowly but steadily, pressing the eye back and closing it up. There was no pain and no history of traumatism or constitutional taint. An operation was proposed, but refused.

The patient returned in January, 1894. The tumor had grown slightly and presented as a nearly smooth, rounded mass, about the size of a walnut in the center of the left supraciliary ridge. It was absolutely hard to the touch, immovable, not painful on pressure. The eyelid hung down, being otherwise of normal appearance. When the lid was lifted vision was 20/CC., with 4.50 D cyl., axis 55° 20/L.

On January 10, 1894, the patient was operated at the German Hospital. An incision was made along the eyebrow, through the

A Anterior (temporal) surface. *B* Inferior. *C* Posterior. *D* Anterior (en face).

No. 1.

soft parts down to the bone. The thin periosteum was stripped off and the anterior wall of the sinus chiseled away until a fine probe could be introduced, which showed the tumor attached by a moderately broad pedicle to the posterior wall of the sinus. Grasping the tumor firmly with a bone forceps, it came away readily, leaving a rough surface at the point of attachment. Recovery was uneventful, and there has been no return of the growth. The eye is still slightly lower than the right, but in the same antero-posterior plane. Vision 20/CC. — Javal shows 8.00 D. of astigmatism and with + 4.00 D. cyl. Ax. 90° ⌒ — 4.00 D. cyl. Axis 180°. V. = 20/L.

The tumor is composed of a dense ivory-like shell, enclosing a mass of cancellous tissue, in the center of which there is a cavity of moderate size. A very deep, narrow furrow divides the anterior larger portion, which was external to the sinus, from the smaller posterior portion. The growth measures: Length, 31mm.; height, 25mm.; depth (antero-post.), 20—28 mm.; greatest at nasal extremity.

FIBRO-SARCOMA OF RIGHT ORBIT.

By F. M. WILSON.

BRIDGEPORT, CONN.

Bridget Clancy, age 58, stout, healthy Irish woman. The tumor has been large enough to attract attention for twenty-three years, but most of its growth has been during the last three years. She claims to have suffered no pain until within a month. She also claims that her sight was "good" in the right eye until about three years ago. The external portion of tumor is roughly spherical and about 2⅝ inches in diameter. The most anterior portion is the cornea when the upper lid is let alone, but by frequent manipulation with her finger she keeps this enormously stretched upper lid pulled over the cornea most of the time. The palpebral slit is two inches in length. The stretched lower lid fits the tumor

closely and is not movable. The upper lid is freely movable. There is central opacity of cornea, and the surface of the cornea is 1¼ inches anterior to the upper edge of orbit. Notwithstanding this great displacement of the globe forward, the reaction of the iris to light is not wholly destroyed. She can move the globe about 30° horizontally and about 15° in vertical meridian, and she has perception of large moving objects. The fundus cannot be seen on account of opacity of cornea.

The removal, on July 6th, was much easier than I expected. The lower lid was entirely sacrificed, the incision being made along the lower edge of orbit. The tumor was not adherent to the bone of the orbit at any point. The periosteum was smooth. The hemorrhage was insignificant. Back of the main tumor, which was hard and fibrous and enclosed in capsule, the orbit was filled with a mass of friable material, which had been broken off from the tumor during the operation. A small amount of apparently normal tissue was left at the apex of the orbit. The upper lid had been so stretched by the tumor that after the removal of the lashes it furnished a more than ample flap, and was stitched to the skin at the lower edge of the orbit. An opening was left for drainage at inner canthus. The healing was uneventful. Two openings, one at inner canthus and one about the middle of the flap, still persist.*

PATHOLOGICAL REPORT BY DR. JOHN E. WEEKS.

"Section of the tumor and globe from Bridget Clancy discloses the fact that the eyeball, optic nerve, and sheath, and the extrinsic muscles of the eye are not involved in the tumor tissue. While the optic nerve runs through a part of the tumor, it lies in a groove and appears to be free from any involvement. Except a flattening of the globe at its posterior pole, where it rests against the tumor, the eyeball appears to be normal. The tumor is entirely surrounded by a connective tissue sheath† where the tumor is not broken.

"Size of tumor, including eye, vertical diameter, 64^{mm}.; transverse diameter, 51^{mm}.; antero-posterior diameter, 60^{mm}. Weight,

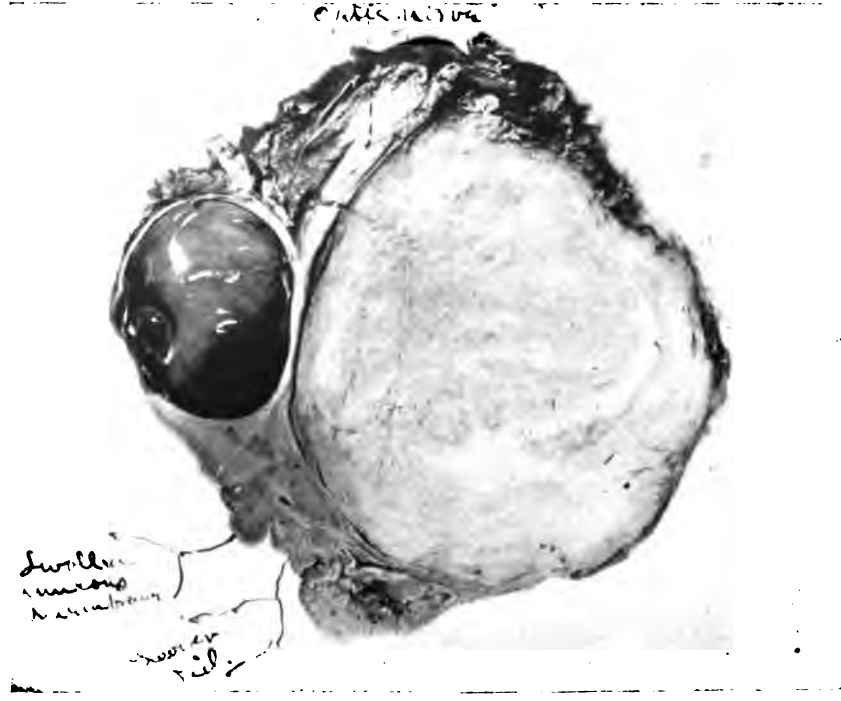
*They have since closed.

†The part of tumor broken off was not enclosed in connective tissue sheath.

No. 2.

No. 3.

No. 4. MRS. BRIDGET CLANCY — Ninth day after operation.



No. 5. PERPENDICULAR SECTION OF TUMOR.

136 grammes. The orbital tissue outside the capsule of the tumor is apparently normal."

Microscopical. — "The tumor is made up of fibrous tissue, the fibrillae being associated in bundles and apparently undergoing hyaline degenerative change, in some parts becoming much hypertrophied and assuming the condition found in cylindroma. In the newer parts of the tumor the connective tissue is more nearly normal in appearance. In the older parts, particularly in the friable portions, the character is like that of cylindroma. Between and among the connective tissue bundles, numerous large cells are found which have a more or less spindle shape. In the newer parts of the tumor the appearance is that of simple spindle cell sarcoma.

In other parts the cells are less regular in shape, and much less numerous, the connective tissue predominating. In some parts of the tumor the nuclei of the cells are large and elongated, having much the appearance of non-striated muscle tissue. The new-formed blood vessels are very small, not plentiful, and have but little more in the way of walls than that supplied by the tumor cells themselves. The walls of preëxisting blood vessels have become much hypertrophied, a fibro-hyaline change having taken place. The capsule is composed of connective tissue elements, rather rich in nuclei. The tumor is properly a fibro-sarcoma, very slow in development, undergoing a degenerative change in its older parts."

DISCUSSION.

DR. T. R. POOLEY. — This case is certainly one of the most immense orbital tumors that any of us from New York ever had the opportunity to see; in fact, in our day a tumor seldom gets the opportunity to grow to such proportions.

An interesting feature is that while the lid could be opened it could not be closed without the patient took hold of the free border of the lid and drew it over the tumor. In that way only could she protect the cornea. Dr. Wilson gave the members of the New York Ophthalmological Society an opportunity to see this case at the June meeting, and the question that arose there and that interested me very much was the conflicting views of the gentlemen

present concerning the propriety of an operation. As I remember it, there were only two or three who favored the removal of the growth, the objection being that it would return and the patient would die. Dr. Wilson is to be congratulated upon having the courage to do such an operation, and it is to be hoped the patient will have no trouble. For my part, I was decidedly in favor of the operation.

DR. WILSON. — The thing that interested me as much as anything else was the preservation of motility and reaction of the iris and of the small fragment of vision in an eyeball that was so displaced that the cornea was 1¼ inches in front of the orbit.

A CASE OF LIPOMA OF THE ORBIT.

BY E. GRUENING, M.D.,
NEW YORK CITY.

Lipoma of the orbit seems to be a rare affection. In my literary researches I have not been able to find a single well-authenticated case.

In 1880 Berlin * said in his chapter on orbital tumors that of the four reported cases of lipoma of the orbit all were doubtful on closer examination.

Fourteen years later Panas † wrote in the same strain, and in 1898 C. S. Bull ‡ made mention of a few recorded cases, but added that they were questionable.

The case I wish to report is one of lipoma of the orbit.

The patient, a Hungarian by birth, 35 years of age, presented himself at my clinic at the New York Eye and Ear Infirmary on October 2, 1897. He said that at the age of fifteen he noticed that his right eye began to swell. The swelling was not very conspicuous, it caused him no pain, and altogether very little inconvenience, but he desired to have it removed for cosmetic reasons.

On examination a roundish, soft, and elastic body was distinctly felt along the lower orbital rim. The mass was painless on pressure, could be easily pushed into the orbit, but fell forward

*Handbuch der gesammten Augeaheill Kunde. Graefe & Saemisch. Band VI.
†Traité des Maladiés des Yeux, Paris, 1894.
‡Diseases of the Orbit. System of Diseases of the Eye. Norris & Oliver, Philadelphia, 1898.

LIPOMA OF ORBIT.

Drawn by Dr. Louise Cordes.

as soon as the finger was removed. The skin was not adherent, could be lifted in a fold and showed no discoloration. Under ether an incision was made along the lower edge of the orbit through the torso-orbital fascia. A yellowish mass of the size and somewhat of the shape of a lima bean was removed through the wound, together with some other orbital tissues, notably fat lobules. The wound was closed with interrupted sutures and healed nicely.

The anatomical examination of the tumor was made by Dr. Louise Cordes, who made the following report:

Tumor of the orbit, 2 C. M. 8 mm. × 1 C. M. 8 mm. × 5 mm.

Mass oval in outline, of yellowish white color; surface smooth, showing slight indications of lobulation.

The tumor is attached by one end to a membrane grayish in color, containing within its folds clusters of small fat lobules not different from those usually found in the tissue surrounding the globe.

Microscopic Examination. — Material fixed in formalin and hardened in alc. 95%.

Sections of the tumor show fat cells grouped to form lobules.

Section of the membraneous material shows connective tissue containing moderate number of blood vessels, a large number of striated muscle fibers in transverse and oblique section; also a few small nerve trunks and numerous fat cells.

Diagnosis. — Lipoma of orbit.

The tumor grew in the orbit, is composed of fat cells, has a distinct capsule, and differs in size, consistency, and form so much from the ordinary orbital fat lobules as to constitute an anatomical entity, a lipoma of the orbit. This relation is shown in the accompanying accurate and artistic drawing, for which I am indebted to the skill and kindness of Dr. Louise Cordes.

DISCUSSION.

DR. C. S. BULL. — The only point I wish to refer to is the extraordinary rarity of these tumors as Dr. Gruening has pointed out.

DR. WARD A. HOLDEN. — The more we examine tumors of the orbit the more are we surprised at the variety which occurs there. We frequently find tumors of which no similar record can be found in the literature. As for fatty tumors of the orbit, I should like to refer to one I have examined which was removed some years ago by Dr. Born. It was 1¾ inches in length by ¾ of an inch in the other diameter, and was encapsulated. Two-thirds of the tumor was purely lipoma, a small portion angioma, and one end of it distinctly fibromatous. The association of these three varieties of tumor is not unusual.

DR. G. E. DESCHWEINITZ. — I confess I am surprised to hear of the great rarity of lipoma of the orbit. Whether Dr. Buller has ever put his case on record or not I do not know, but I have recently seen an article on tumors of the orbit written by him in which he records with a photograph a very well marked example of bilateral orbital lipoma. The photograph is that of an old man. The appearances of the lid described by Dr. Gruening are evident. How pure a lipoma it was, or what its relation to the rest of the orbit was, I cannot say.

DR. H. KNAPP. — A parallel case to Dr. Gruening's is now under my care and it is much more developed. It is a woman about forty-eight years of age, who came to me some months ago with a large tumor in both lids, accompanied by exophthalmus. The tumor presented itself at first in the lower lid and the upper lid became invaded later. The eye is blind, the optic nerve atrophic, and the mobility of the globe is restricted. There is a fleshy mass with exactly the feeling of fat, which extends beyond the limits of the orbit in, out, and below. There was a lump of tumor on the inner and outer sides of the lid whose limits could not be ascertained. I had no doubt the tumor was a lipoma and advised operation. As the whole thing encircled the eye, the operation was divided into three portions. The outer part, which was the first I removed, was found to extend back of the eye a considerable distance. There was slight encapsulation and the mass was clearly of the appearance of orbital fat, only somewhat more dense and slightly softened in the center. About four weeks ago I removed the lower part and I found its anterior surface lined with a thin capsule. It was a continuous mass to the tip of the orbit and seemed to be composed of tissue the exact counterpart of the normal orbital tissue. The third portion has not yet been operated upon. I did not think it proper to operate upon this tumor, which was so large, all at one time.

ON THE OPERATIONS FOR SECONDARY CATARACT.

BY HERMAN KNAPP, M.D.,

NEW YORK CITY.

Mr. President, the immediate cause of my choice of the above subject as a communication to the society was an unfortunate case of discision of a capsule after a perfectly successful simple extraction. Until the time of its occurrence I could say that I had never lost an eye or even materially injured one, by discision of a secondary cataract. The case is as follows:

Mrs. M. H. Gillette, 76 years old, of New Haven, Conn., had a mature cataract removed on March 22, 1898, in the hospital of the New York Ophthalmic and Aural Institute. Operation and recovery without accident. Discharged in 16 days with a round, central, perfectly moveable pupil, without a trace of an adhesion. Vision 20/70. Six weeks after the operation she came again for a "needling." Her eye had been free from irritation. The capsule stretched evenly through the pupil, the line of union of the peripheric opening of the capsule was hidden behind the iris. Only the upper part of the capsule was clear, the remainder beset with dots and small lines, thickenings by proliferation of the intracapsular epithelium. As it was certain, to my mind, that her present, sufficiently good sight would weaken by wrinkling and further dotting of the capsule, I advised her to have discision performed. With a knife-needle I made a curved incision through the inner and upper (clear) part of the capsule, and crowded the lower part by gentle pressure to the lower side of the pupil. No vitreous escaped; the pupil, filled with vitreous, was clear, and sight excellent.

No reaction for 2 days. In the third night pain in the eye set in, increasing and spreading around the eye and over the adjacent side of the head in spite of pilocarpin and eserin instillations and morphine, given internally by the house surgeon, who found the cornea dull, the anterior chamber shallow, the iris bulging, and the eyeball very hard. The next morning, though she felt somewhat better, I was informed and went to the hospital at once. Finding the same condition, a very severe attack of acute glaucoma, I proposed and, with the patient's consent, made an immediate *operation*, May 7th.

Incision of 5 mm. in upper sclerocorneal border. Aqueous escaped and vitreous presented. A Mathieu forceps introduced into the anterior chamber failed to grasp the iris. A first attempt with Tyrell's blunt hook was likewise unsuccessful; at a second attempt the iris was drawn out, but slipped back at the moment I wanted to cut it. The cornea

having become clear, the iris bright and flat, the pupil black and pear-shaped by folding of the iris near the upper corneal margin, I abstained from further attempts, having in mind a previous case, in which I did not succeed in drawing the iris out, yet the result was a good and permanent recovery. I also remembered the statement of H. Pagenstecher that he cured his cases of that nature with paracentesis of the anterior chamber.

The lady was at once relieved of all her pain, her eye was quiet and sight good. This lasted four days, then at 7 p. m. the eye began to feel uncomfortable, later it was quite painful and at 2 a. m. nausea and vomiting set in. Pilocarpin and morphine quieted her. From now her symptoms were those of iritis, with occasional slight increase of tension. Six days after the operation the cornea, iris, and pupil were dull, there was a slight grayish sediment in the anterior chamber, the vitreous was grayish and sight reduced to perception of the movements of the hand. T+½.

(Second operation). Under ether I made a somewhat longer incision at the upper scleral margin, drew the iris out at the first attempt with Tyrell's hook, and abscised it. Some vitreous was lost. The patient felt relieved at once. The hypopyon was seen no more, the inflammation of the eye disappeared gradually, the pupil cleared itself, and the patient was discharged June 4th, 28 days after the first operation for glaucoma, the eye almost white, in good shape, F and Tn, counting fingers at 6 inches, with + 13D. July 16th she could count fingers at 4 feet, but the eyeball was somewhat softer than the other.*

As rare cases frequently come in pairs, I may briefly mention another case of acute glaucoma after a discision of secondary cataract:

Mrs. Mary Smith, aet. 59, simple extraction May 9, 1898, discharged in two weeks with S = 20/100. Discision June 6, 1898. Well until June 10th, when in the night she had a violent attack of glaucoma, with nausea and vomiting. At 2 p. m. the next day I found the cornea and iris dull, the capsule crowded to nasal side, where the iris was bulging, while it was dipping down on the temporal side. Counted fingers indistinctly at several feet. T+2. Operation under ether. Incision of 5 or 6 mm. at the bulging part of iris, iris drawn out with blunt hook at first attempt, and cut. Vitreous escaped. The eye recovered without disturbance. Patient, not from New York, discharged on the 13th day after the iridectomy, with S 20/40.

From October, 1897, to June, 1898 (inclusive), I have performed 70 operations for secondary cataract, 64 of which were discisions with the knife needle. Besides the above two cases of glaucoma, another, milder one, occurred which recovered by the

* *Note at the Correction of the Proof.*—The eye turned out better than I expected. Cornea, pupil, and vitreous clear, background normal. S 20/100, with + 17D. patient reads No. 1. F and Tn. No discomfort whatever. October 23, 1898.

use of miotics and morphine. There was one case of capsulotomy, and six cases of iridotomy, all of which did well.

The visual results of the seventy operations may be seen in the following table:

DISCISIONS.						OPERATIONS WITH FORCEPS-SCISSORS.		
Before.	After.	No. of Cases.	Before.	After.	No.	Before.	After.	No.
20/40	20/30	1	20/200	20/40	2	CAPSULOTOMY.		
			20/200	20/50	5			
20/40	20/30	3	20/200	20/70	3			
20/50	20/40	1	20/200	20/100	1	12/200	20/200	1
20/50	20/50	4	18/200	20/40	1			
20/70	20/20	1	18/200	20/50	1	IRIDOTOMY.		
20/70	20/30	4	16/200	20/70	1			
			15/200	18/200	1	20/200	20/70	1
20/70	20/40	5	15/200	20/30	1	10/200	20/200	1
20/70	20/50	2	15/200	20/70	1	10/200	19/200	1
			12/200	20/100	1	5/200	5/200	1
20/70	20/70	1	12/200	20/40	1	1	10/200	1
						∞		6
20/70	½/200	1	10/200	20/50	1			
20/100	20/40	4	8/200	20/50	2			
20/100	20/50	1	5/200	20/200	1			
			5/200	20/70	2			
20/100	20/70	3	4/200	20/200	1			
			1½/200	20/40	1			
20/100	20/100	1	1/200	18/200	1			
			1	20/100	1			
			∞	3½/200	1			
					64			

From these statistics it follows that out of 70 operations for secondary cataract, sight was improved in 63; it remained the same in 6, and was almost lost in 1 case. I want to mention that in the majority the vision put down in the table is the result of the test at the discharge of the patient, when the vitreous has not yet sufficiently cleared up. There are only two cases with S. 20/20, but a goodly number with 20/30, 20/40, 20/50, sufficient for all purposes; many of them surely will rise to 20/20. The great majority of the seventy operations for secondary cataract were recent

cases; in a few the extraction had been done several years before, where the vision, good at first, had deteriorated later.

Will you grant me some *explanatory remarks?*

Q. *Why operate on eyes at all as long as S is no less than 20/50 or even 20/70?*

A. *That depends on the case.* If the patient is healthy and active, why not furnish him as much sight as his eye is capable of. This implies that the secondary operation is, rare accidents excepted, safe. As to the latter point opinions differ greatly concerning discision, which, with proper indications, I consider the most available and the safest of all. I have made this operation many hundred times. Iritis and irido-cyclitis have occurred exceptionally without doing much harm. Suppuration has never occurred, thus far, in my own practice. It has in the practice of others, and what has occurred to others may occur to me to-morrow. Dr. Noyes is afraid of the operation, and quotes Trousseau, who lost two cases in succession by suppuration. Why? Probably because he operated on eyes harboring dormant, pyogenic germs that had been introduced through the extraction wound.

The technique of the operation may be faulty, and, consequently, the result unsatisfactory. I have read, seen, and done a great deal concerning the operation of discision. About the best that has been written on it is contained in an earlier article by W. Bowman.*

In the technique of discision there is one rule of paramount importance: *Do not tear; cut.* Parts that cannot be cut are not for needle or knife, but for scissors, in or outside the eye, which means capsulotomy, extraction, iridotomy, iridectomy, cyst-iridectomy All authors agree that the results of laceration are most disastrous if the ciliary body is torn at. I have seen in my own operations that the greatest reactions, glaucoma and cyclitis, occurred when I moved the needle through the parts surrounding the scar of the corneal section. This neighborhood is the weak point in the eye after extraction. The lens has to pass through it, often bruising

* W. Bowman. On Extraction of Cataract by Traction-Instruments, with Iridectomy. With Remarks on Capsular Obstructions and their Treatment. Ophthalmic Hosp. Rep., Vol. IV, 1865.

cornea and iris, leaving parts of itself behind, and displacing others. The operator, in cleansing the eye, crowds into that locality débris of lens, shreds of capsule, pigment and particles of the iris, blood, and occasionally also some microbes. When I made the incision through the capsule in this neighborhood, in particular when I cut across the scar in the capsule, left from the peripheral opening, in such a way as to plunge the point of the knife-needle through the capsule above the scar and cut the latter in going from the periphery toward the center, I witnessed the greatest reaction. When, as in the first case here reported, I swept the needle across a peripheric part of the capsule, tearing the latter off the ciliary processes, glaucoma was the consequence.

Another question: *Is discision of the capsule usually efficient?*

A. *It is, if properly done.* A single straight incision rarely secures a permanent opening. It can do so only when there is cicatricial contraction of the capsule toward the periphery. A T-shaped incision mostly, and a crucial incision always gives a permanent opening, provided the cuts are large enough. Bowman advises to introduce his needle (" which should be cutting for a twentieth of an inch at the spear point, the stem cylindrical, perfectly fitting the corneal puncture so that no aqueous humor escapes ") near the corneal margin, push it through the anterior chamber as far as the opposite margin of the pupil, cut through the capsule in different directions, " comminute it," without entering deeply into the vitreous. This is an entirely different plan from the one I have advocated so long. It has many followers to-day. I do not think that Bowman operated by oblique illumination, the proper use of which is indispensable to do a purely cutting operation.

The technique of discision of secondary cataract is difficult, but beside the above rules I have nothing to add to my former publications.

Bowman[1] and Teale[2] seem to be the first to mention the oc-

[1] W. Bowman, Brit. Med. Journal, Jan. 30, '64, p. 135, and Ophthal. Hosp. Rep., IV, p 365.

[2] Teale, Brit. Med. Journal, ibidem, p. 404.

currence of glaucoma after discision of the capsule. Von Gräfe[3] knew it and describes it well in his large, latest article on glaucoma. And H. Pagenstecher[4] says, as mentioned above, that the three cases in which he could not cure glaucoma by miotics yielded so promptly on a *small puncture of the anterior chamber* that he would never resort to an iridectomy without having first tried puncture in the sclero-corneal margin. Bowman, in his article in the Ophth. Hosp. Reports, Vol. IV, p. 366, says: "It is certain that a *puncture of the bulging iris* with a broad needle, opening a communication with the anterior chamber, usually suffices to relieve the heightened tension, and to cause a subsidence of the rising inflammation."

Besides these operations for the chief consequences of discision of secondary cataract, I should not omit to mention that for the discision of capsular obstructions a *broad needle or a Gräfe knife* has been used with good effect. The knife admits only of one incision at one sitting, but as it is a good cutting instrument it is alleged to be appropriate for denser capsules.

Other methods of operating for secondary cataract are *dislocation with a needle introduced through the sclerotic, scleronyxis,* which has been particularly favored by the Austrian clinics. Of its merits or demerits I cannot judge from personal experience. *Keratonyxis,* which I have tried, has not given me encouraging results.

2. *Extraction of secondary cataract,* particularly advocated by Panas, has been done by many earlier and present eye surgeons, myself included. It seems excellent for tough, non-adherent capsules, and may gain greater popularity now, since asepsis came into general use, when the necessary instruments and the technique shall have been perfected.

3. For *secondary cataracts complicated with products of iritis or iridocyclitis,* the old operations of cutting them through with *forceps-scissors,* revived by DeWecker, have become quite popular

[3] Gräfe, Beiträge zur Pathologie u. Therapie des Glaucoms. Arch. f. ophth., Bd. XV, Abth., III, 223, 1869.

[4] H. Pagenstecher, Über Glaucom bei Nachstaar operationen. Zehe Kl. Monatsbl., XXXIII, p. 144.

and serve a good purpose. Esberg[1] and Schweigger[2] have designed more delicate forceps than DeWecker's. The last five operations in the above tabular report were done with these instruments. There was no particular reaction in any of them. Schweigger uses the forceps-scissors also for purely capsular obstructions. He considers the operation practically harmless and finds the results satisfactory.

4. In occlusions of the pupil after extraction from cataract good results may be obtained also from *simple incisions with a Gräfe knife, crossing the fibers of the iris* near but not through the pupillary margin of the iris.

5. Iridectomy and cyst-iridectomy are operations which I have not infrequently practiced in complicated secondary cataracts. I have found them very useful, often enough yielding excellent results.

This, gentlemen, is a brief enumeration of the resources at our command in dealing with secondary cataract. I think the subject to be of sufficient importance to deserve our untiring attention. The table which I have laid before you contains cases in which the second operation raised the vision from 1/200 to 20/100, from 4/200 to 20/40, and the like, which is certainly gratifying in the highest degree. I may conclude by saying that the table contains all the operations for secondary cataract which I performed during the last nine months, without omission of the complicated cases. What is worth operating is worth reporting.

DISCUSSION.

DR. D. B. ST. JOHN ROOSA. — This very interesting account from a man of such very large experience in operations for membranous cataracts is, I am sure, exceedingly instructive. Dr. Knapp takes the position, if I understand it, that even if vision is fairly good and the patient in good health, it is well to perform a capsular operation as the risks are so slight.

Now with that position I would take issue. I think it is unsound because the dangers are not nil. The dangers of loss are small indeed, but they exist. If our patient is unfortunate enough

[1] Esberg, zur Operation des Nachstaars, Zeh. Klin. Monatsbl., 1895, p. 249.
[2] Schweigger, Archives of Ophthalmol., Vol. XXVII, 1898.

to get only 20/70 vision, but is able to read and write and perform the ordinary duties of life without discomfort, I would certainly wait with him, no matter how attractive the capsular operation, until the condition of his sight rendered it difficult for him to get on with his duties according to his station in life. Then we all agree that the risk should be taken.

I was glad to hear the position taken in regard to extraction of the capsule. I think we shall live to see the day when in all cases where there is no adherence of the iris to the capsule that extraction instead of division will be the operation, and even if extraction be not complete and does not get the whole of the capsule a portion of it is removed from the line of vision and the obvious advantage over capsulotomy is very great. From our present knowledge of the origin of inflammatory trouble in the eye we are able to perform that operation with much less danger than a division. We are indebted to Panas for the revival and amplification of the field of extraction of the capsule.

DR. H. D. NOYES. — In the case of those who do not perform peripheral section of the capsule, perhaps the necessity for secondary operations does not arise with so much frequency, but I have for some time pondered over conditions that give me much trouble after simple extraction. For example, a case presents itself with moderate amount of opacity of the capsule, a round, central pupil, without adhesions, but with unsatisfactory vision, 20/70 or less, and the capsule is wrinkled. In case the pupil yields imperfectly to mydriatics, which is rather frequently met with, I have found that I could not get an opening by a simple division with one needle. I have in many instances resorted to the employment of two needles in the usual way from points nearly opposite on the cornea, but that also fails at times, and, for quite a number of years in certain cases I have introduced a needle through the sclera.

DeGamo Pinto wrote an article a few years ago in which he advocated the Graefe knife for the division of all capsular opacities, and he introduced that knife through the sclera. I have not done exactly that, but I have used a long needle and have succeeded because the leverage is greater. In some cases I introduce a needle through the cornea at the same time. I always work under oblique illumination. Although the reaction is greater when puncture is made through the sclera, I have not had any difficulty with it and the results have been satisfactory.

My mind goes back to the operation of extraction of thickened

capsules. In my earlier days that was a favorite operation, but in the pre-aseptic period disastrous results occurred, and I have not resorted to it of late. I endeavor to get around those cases by other methods, and have not been willing to take the risk of extraction of the capsule, even though I admit that when you can get it out it is a beautiful thing to do.

DR. PETER A. CALLAN. — I congratulate Dr. Knapp on his wonderful results in never having had suppuration following operations on secondary cataracts. So far as the cutting of secondary membranes is concerned, I find that it is a very difficult matter to get a knife sharp enough to cut, and I find myself more and more inclined to resort to the DeWecker scissors, especially if the membrane is any way dense. I have never had any reaction after their use.

DR. C. F. CLARK. — Something that Dr. Noyes said reminded me of an instrument that he devised many years ago for extraction of opaque secondary membrane, and though he has probably forgotten it, the instrument still exists and I have been using it for some years. I had a pair of his scissors made curved on the flat and found them far superior to the DeWecker scissors. With them I have at times performed the operation without any serious reaction and taken out a complete section of the thickened capsule. With a broad knife, something like the Agnew knife, an incision is made into the cornea and upper portion of the pupillary membrane through which the scissors may be introduced. On one occasion I found them insufficient to make the V-shaped segment with two cuts, and, as my attempt to complete the operation succeeded, I think it is worth describing. After making the lateral cuts I found that the edges of the incisions would not meet at the bottom, and I then turned the eye well down, passed the scissors in on the flat with their convex surface parallel with the concave posterior surface of the cornea, and made a cut across below to unite the first two incisions, forming a truncated triangular pupil. I have been frequently impressed with the opinion expressed by the last speaker that scissors in case of thickening are much safer than the needle.

DR. LUCIEN HOWE. — I would not venture to say anything on this subject as comparing my experience with that of Dr. Knapp, but there are two points I would like to speak of. First, it does not seem clear in my mind whether the results we sometimes get are due to infection or to disturbed nutrition with production of

glaucoma. Second, it is not out of place to mention in this connection a simple device for opening the capsule after this has been closed by the exudates accompanying a severe iritis such as sometimes follows extraction. This instrument consists of a triangular blade like the ordinary iridectomy knife only the cutting edges of which remain. The central triangular opening is fitted with a knife of similar form, a hinge being formed at the base of the triangle. From this hinge the smaller knife moves in and out of the opening in the larger, by means of the two springs which form the handles, working as do iridectomy scissors. At first I considered the device practically useless, but if, in these cases, an ordinary iridectomy knife is first entered as usual at the scleral margin, and pushed forward to perforate the thickened capsule, then, after withdrawing the ordinary iridectomy knife, the instrument mentioned can be introduced in the track which the other followed, and by opening the blades a piece of the capsule can be literally punched out. In some cases an opening can be obtained in this way when practically impossible otherwise. Apparently, the procedure gives promise of better results, although the instruments made thus far are by no means perfect.

DR. T. R. POOLEY. — It seems to me all these operations other than discision are open to serious objections. In many instances the repeated introduction of instruments enhances the danger to the eye, and the best results I think must come from a discision performed with proper technique. Dr. Knapp, in describing the ease with which his operation is done, covers up the real difficulty. To me it is one of the most difficult of operative procedures and the main point lies in the efficiency of the knife and the absolute necessity that you shall cut and not tear the membrane. The difficulty lies in the incision made to reach the horizontal one. If the knife is in any way imperfect or there is any leakage of aqueous from the anterior chamber, the difficulty is greatly increased. I am obliged to Dr. Knapp for the information given this afternoon that the vertical incision should always be made from below and not from above. I think that is an important innovation.

DR. O. F. WADSWORTH. — For a good many years I have done a secondary discision in a very large proportion of cases. I did that before I made the simple operation, and I have continued it since I have been doing the simple operation during the last few years. Fortunately, I have not had either glaucoma or suppuration. I have had irritation in several cases, but none I believe

that has done any permanent injury. An important point has been already referred to, the necessity for having a sharp knife, and it seems to me that it is the main thing. One must avoid the denser parts of the capsule and must not tear the tissue. Although I add to the simple incision of the capsule above, which Dr. Knapp makes, a vertical incision, I do not think the necessity for discision later is any less.

DR. KNAPP. — I want to speak first of Dr. Howe's punch. It looks very nice, but I have had a great deal of difficulty in using the scissors, and I fear this instrument would be worse in handling it safely.

With regard to the extraction of the capsule I am very much of the opinion of Dr. Noyes that it is difficult to seize the capsule and difficult to get it out without tearing the ciliary processes more or less. It can be done if we make a small opening into the capsule and catch the capsule by means of a hook.

I must place myself on the side of Dr. Pooley, that discision is by far the safest and is indicated in at least 95% of the cases in which the capsule is thin enough to be split, and there are places where there is but little resistance.

I have spoken exclusively of traumatism here. Iritis is seen occasionally, but infection ought not to be, and I cannot say that I have suffered from its advent very much. There has been scarcely a case where I could ascribe the inflammation to infection. It is necessary to operate aseptically at the secondary operation as well as at the primary one. The first operation is much longer and it is much more easy to introduce germs which need not always produce pus. They may lie there dormant, and I think some later irritation or traumatism may cause them to start up again into activity.

DR. NOYES. — I have had that happen after two years.

DR. KNAPP. — I have seen it ensue by blunt force twenty years after the operation. The suppuration was either due to the introduction of germs at the primary operation or it was due to autoinfection.

BUPHTHALMIA; AN INTERESTING SERIES OF CASES OCCURRING IN THE SAME FAMILY.

BY WALTER B. JOHNSON, M.D.,

PATERSON, N. J.

ILLUSTRATED.

The terms megalophthalmos, hydrophthalmia, and buphthalmia seem to have been used to designate ocular conditions more or less similar. Lexicographers in defining the application of the terms are somewhat confusing; their definitions taken conjointly render a scientific classification difficult. The series of cases here reported and termed buphthalmia may be described as: An abnormal general enlargement of the eyeball, as compared to the size of the head or body, a condition occurring congenitally or in infancy, not the result of intra-uterine inflammatory disease, but probably akin to glaucoma in the adult.

The development of the disease in three children of the same family is suggestive of the existence of some possible underlying family tendency for the production of this condition, which could not, however, be practically demonstrated. The results attained in the cases in which early operation was performed are most gratifying, and emphasize the necessity for immediate operative interference in such cases.

The family history, as detailed by the father, J. F., is as follows: So far as he knows, no member of his own nor of his wife's family ever had any form of eye disease, except himself. When he was about seven years of age, his parents first noticed that he had some disease affecting the left eye, with which he was unable to discern objects or light. He does not believe that he ever had any vision in the eye, nor can he recall any time when he suffered from inflammatory disease. Upon examination the left pupil is found to be dilated and does not react to light. Occupying about

CASE NO. 1.

CASE NO. 2.

three-quarters of its area is a calcareous, partially disintegrated lens; there are some pigment deposits upon it, indicating possible old inflammatory trouble. There is no increase in tension.

R. E. V. = 20/20.

L. E. V. = no perception of light.

He and his wife are each strong and healthy; all of their children are and always have been robust. He was eighteen and his wife twenty-one years of age when married. The first three children, two boys and a girl, were not affected by any disease or physical defect.

CASE I. Six and one-half years after marriage, another female child was born J. F. When two months old the parents first noticed that the eyes were increasing in size and lachrymation was constant and profuse; the corneæ were becoming hazy. A physician was consulted, who prescribed drops and an eye wash, which the parents continued to use for two years. During all this time the symptoms became more marked, the eyeballs increased in size, the corneæ became whiter, and the eyesight poorer. The child was then taken to Naples to Santa Aniello Hospital for the purpose of consulting Professor de Vincentiis. She was admitted to the hospital and an operation was performed at once — probably sclerotomy. The child remained about twenty days. After this time the eyeball did not increase in size disproportionately to the natural growth of the body. The corneal opacity decreased; there was, however, no appreciable improvement in the vision, which has since that time remained about the same. The father thinks that both eyes were operated upon.

The patient, now seven years of age, is well developed, has no physical deformity, has never had any disease or sickness of any kind except measles, which she contracted when a baby. The eyeballs, as shown in the accompanying photograph, are enormously enlarged and about equal in size; there is more or less constant nictation; the tension is increased to about + 1. The corneæ are somewhat hazy, their area very much increased. the arc very irregular, the diameter is slightly less in the right than in the left eye. It is in the horizontal meridian one-half

inch; in the vertical, five-eighths of an inch; the anterior chamber is of about the usual depth. The right eye has a scar at the limbus of the cornea superiorly, the pupil is contracted and adherent to the anterior capsule; the lens is cataractous. The left eye shows a moderate dilatation of the pupil, which is very sluggish in its response to light.

R. E. V. = no perception of light.
L. E. V. = fingers at 2′.

In the opththalmoscopic examination of the right eye the field cannot be illuminated. The left eye has fairly clear media, the fundus is clearly visible, the retinal vessels are decreased in size, the optic disc is bluish-white and considerably cupped. The eye-ground is otherwise normal in appearance.

CASE NO. II. M. F., female, two years of age. When an infant about one month old her parents, having been previously warned to be observant in case of the birth of future children, in consequence of the danger of delay, noticed that she had trouble with her eyes, which were increasing in size and intolerant of light, frequently lachrymating, and the corneæ becoming slightly hazy. When two months old she was taken to Naples to consult Professor de Vincentiis, who operated the day following her arrival at the Hospital Santa Aniello. Upon the right eye, which the father believes was larger than the left, he performed an iridectomy, and upon the left eye probably a sclerotomy.

The child presented for examination is strong and healthy. As shown in the accompanying photograph, the right eye is larger than the left, the corneal area is increased and its outline slightly irregular, there is no haziness, the anterior chamber is of normal depth, there is slight increase of tension in the right eye, in the left eye the tension is normal. The right eye, upon which the iridectomy was performed, now has a large leucoma at the limbus of the cornea, superiorly and to the nasal side, at the point of incision. The iris is incarcerated and the pupil distorted; it is responsive to light. The left eye presents no indication of the performance of any operation.

CASE NO. 3. (Before Operation.)

CASE NO. 3. (After Operation.)

The father thinks that her vision is good. She is active and seems to be able to see fairly well, but will not permit satisfactory examination; cries and closes her eyes. Fleeting view of the fundus can be obtained, and there has apparently been a retino-choroidal inflammation, as indicated by a large area of degeneration below the region of the macula; the remainder of the eye-ground is normal in appearance; the disc is slightly white, but shows no cupping.

CASE III. Baby F., a well-developed female child, was first examined in November last at the Paterson Eye and Ear Infirmary, the parents believing that she also was developing the condition which had appeared in her older sisters. At that time there was apparently but little trouble, and sulphate of eserine grains ¼ to oz. ī was instilled three times a day.

The patient was kept under observation during the next two months, and although the development of the disease was gradual, it was constant. The eyeballs increased in size, the right eye being decidedly larger than the left. The corneæ became hazy, the pupils were slightly dilated, and responded sluggishly to light. The anterior chamber was somewhat shallow; there was lachrymation and intolerance of light; the tension of the eyeballs was increased and equaled + 2. The haziness of the corneæ and extreme restlessness of the child under examination rendered it impossible to obtain a satisfactory ophthalmoscopic picture of the fundus. An operation was advised and performed on January 6, 1898, about two months after the first visit to the Infirmary. The photograph was taken on the day before operation.

The patient was etherized and a double iridectomy was made superiorly. In each instance the iris prolapsed upon the removal of the knife, and was excised, leaving a satisfactory coloboma. She was extremely restless after the operation; it was almost impossible to keep the bandages adjusted except by confining the hands and arms by pinning a sheet about the body. She did well, however; there was but slight reaction. The wound in the right eye healed without incident; in the left eye, on the third day, the cut edges of the iris prolapsed and became incar-

cerated, distorting the pupil. The patient remained in the hospital for nearly a month.

July 12, 1898, the parents were requested to bring the child for examination. They stated that she now has no trouble, lachrymation has ceased except on exposure to bright sunlight. The eyes have not increased in size, and they believe that she is now all right and can see well. The photograph was taken on this date.

Upon examination the eyeballs appear to have stopped the abnormal development, the corneæ are clear, the tension is about normal, and the pupils responsive to light. In the right eye there is a perfectly satisfactory coloboma; in the left eye there is a darkened scar at the limbus of the cornea; at the point of incision the iris is incarcerated and the pupil distorted; both pupils are responsive to light. The ophthalmoscopic examination is not entirely satisfactory; occasional glimpses of the fundus seem to indicate the absence of disease, the vessels, eye-ground, and nerve appearing to be normal. The progression of the ocular growth is abated, and all of the indications seem to forecast future useful vision.

DISCUSSION.

DR. J. S. PROUT. — As Dr. Johnson spoke of the difficulty of keeping the eyes quiet in his cases after operation, I would like to make one suggestion which I have made before in this society; that is, that in these little children a stitch through the lids will hold the eye more quiet than will any bandage. I do not freshen the edges of the lids, but simply tack them together. I have found this procedure useful also after cataract extraction. (See Transactions 26th Annual Meeting, 1890, Vol. V, page 593.)

DR. GEORGE C. HARLAN. — I believe Mauthner said some years ago that buphthalmia is simply congenital glaucoma.

TWO CASES OF METASTATIC CARCINOMA OF THE CHOROID.

BY G. E. DESCHWEINITZ, M.D.,

OF PHILADELPHIA.

Although more than a score of cases of carcinoma of the choroid, in most instances metastatic after mammary carcinoma, have been recorded, each new example of this affection possesses certain features of clinical and pathological interest, and, therefore, I add the following to the list already published:

CASE I. Miss H., aged 40, born in the United States, teacher, consulted me on the kind recommendation of Dr. J. C. Sheridan of Johnstown, Pa., on the 28th of October, 1897, because the vision of her right eye had begun to fail, this failure of vision having first been noted as a marked symptom three weeks previous to her visit, although for some time before this date she had appreciated that the visual acuity of this eye as compared with that of its fellow was diminishing.

History. — The patient had been remarkably free from physical disabilities and had led the active intellectual life of a school-teacher, holding a most responsible position. In March, 1897, she consulted Dr. Sheridan on account of a tumor of the left breast, which on examination presented the clinical characters of carcinoma. Dr. Sheridan removed the entire breast and cleanly dissected out the axillary glands. There was kind healing except at one point, where, owing to insufficiency of tissue, an uncovered surface was allowed to remain and heal by granulation. As soon as the patient recovered from the effects of the operation she returned to her duties as school-teacher. She experienced no difficulty of any kind until her attention was attracted to the dim vision of the right eye. Dr. Sheridan informs me that the tumor possessed the ordinary characteristics of scirrhus of the mamma.

Examination. — The patient was a slender woman, but in spite of the carcinoma there was no cachexia. Examination of the region of operation showed an oval granulating surface, several nodules of recurrence along the line of the cicatrix, and deep-seated nodules in the axilla beneath the clavicle and in the inferior

triangle of the neck. The functions of the other organs of the body appeared to be normal.

Eyes. — V. of R. E. equaled counting fingers at two feet. The media were clear, the tension normal. The optic disc was a vertical oval of good color, surrounded by a partial choroid ring, thicker upon the temporal side. The veins were a little fuller than normal, the arteries natural in size, and there was faint choroidal disturbance upon the nasal side. Beginning near the edge of the optic disc and covering the macular region and extending for some distance beyond it there was a broad, flat, grayish-yellow elevation, the summit of which was seen with + 6 D, while its periphery gradually merged without a distinct line of separation into the surrounding choroid. The peripheral field of vision was normal, but the center of the visual field was occupied by a triangular scotoma extending toward the nasal side.

V. of L. E., after the correction of one dioptre of hypermetropic astigmatism, was 6/5, accommodation 4.5 D. The disc was a vertical oval of good color, the central vessels normal, and the fundus free from disease of any kind.

The patient was kept under observation for ten days, during which time there was notable increase in the size of the scotoma, but there was no pain nor elevation of intraocular tension. The nature of the disease was explained to her, and after consultation with Dr. William F. Norris, who confirmed the diagnosis of metastatic carcinoma of the choroid, enucleation of the eyeball was suggested and the advice followed.

On the 8th of November, 1897, the eye was enucleated and immediately placed in a 5 per cent. solution of formaldehyde. The patient recovered from the effects of the operation very rapidly, returning home at the end of a week, and almost immediately resumed her vocation as teacher. She continued on duty for a month or six weeks, when her strength began to fail chiefly on account of intense pain which appeared in the lower portion of the spine and followed every moment. Strength continued to fail and the patient died in February, 1898, with the symptoms of intracranial involvement.

The eyeball, after hardening, was divided by the ordinary equatorial section, half of it mounted in formaldehyde, and the other half submitted to microscopic examination. The growth proved to be of oval shape, situated at the posterior pole of the

FIG. 1.

Section of Eyeball.
Showing position of metastatic carcinoma of choroid at *a*.

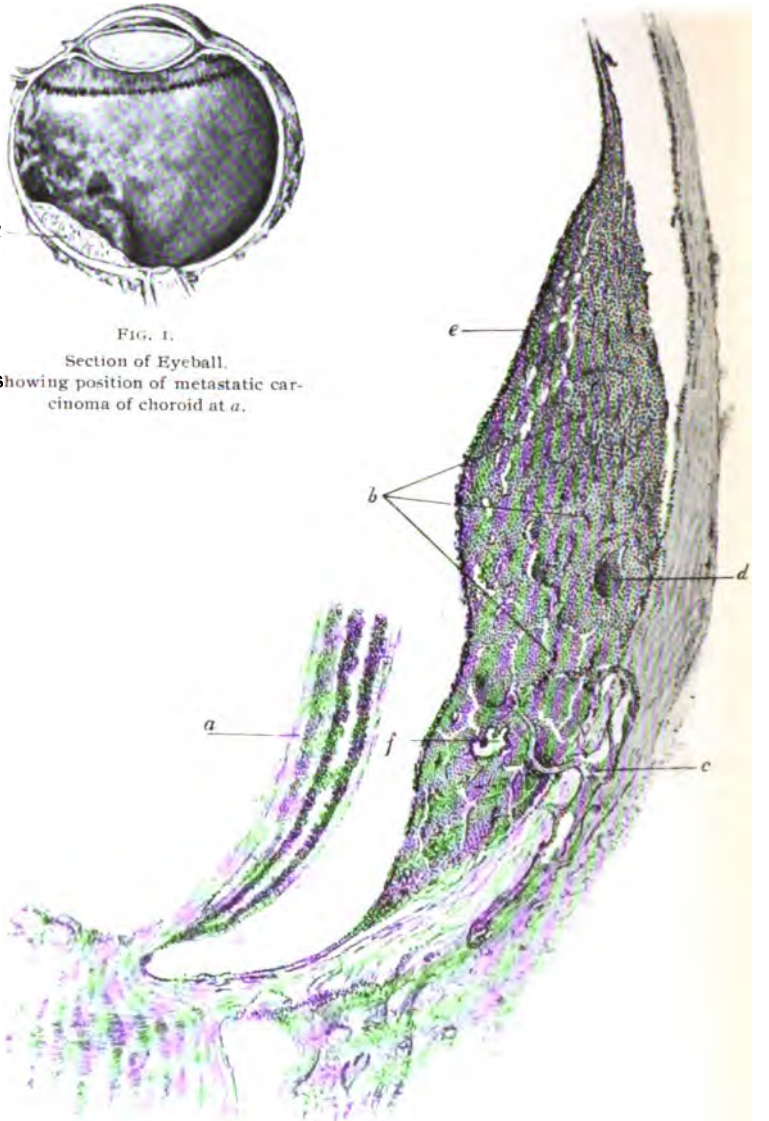


FIG. 2.

Metastatic Carcinoma of Choroid.
a, Retina detached from underlying growth. *b*, Carcinoma, showing slight tendency to form alveoli. *c*, Vessel ascending from sclera into growth partly filled with blood corpuscles, among which, however, cancer cells are not seen. *d*, Focus of small cells, the early stage of a necrotic process to be seen at *f*.

eye, 2½ millimeters in thickness and 12 millimeters in diameter at its broadest part. Its surface was brown, its center grayish-yellow, and, as before stated, it merged gradually at its sides and ends into the surrounding choroid, from which at no point it was sharply separated. (See Fig. 1.)

Serial microscopic sections cut by Dr. J. Dutton Steele from the other half furnish the following histological details:

Serial microscopic sections cut by Dr. J. Dutton Steele from the growth begins and curves quickly upward for six millimeters, and then slopes downward for another six millimeters until it meets the normal choroid on the other side, being bounded above by the lamina vitrea and attached retinal pigment epithelium and below by the sclera. This mass, therefore, occupies the entire width of the choroid. It is composed of epithelial cells, rather spheroidal in shape and with large nuclei, here and there collections of small round cells which are early stages of necrotic foci, some pigment granules and spicules, and a moderate amount of stroma. Toward the bottom of the growth there is a tendency for the carcinoma cells to arrange themselves in long tubules separated by a faint stromal tissue which contains pigment particles. The appearance suggests vessels filled with cancer elements, but is no doubt caused by the cells traveling along the connective tissue septa being deposited in the spaces. A similar appearance is noted by Lagrange. Toward the center of the growth and above the alveolar arrangement is more marked and the individual alveoli larger and broader. In the region of the chorio-capillaris some remnant of the original choroidal structure still remains and vessels plugged with cancer cells are readily distinguished. The necrotic foci, also noted by Mitvalsky, have selected no special portion of the growth for their appearance. In some sections large thin-walled blood vessels, packed with blood corpuscles, pass through the sclera and run through the growth. Cancer cells, however, were not found among the white and red blood corpuscles which plug their caliber, as Schultze did in his specimen. The optic nerve, retina, and remaining parts

of the choroid are normal, and there is no change in the filtration angle. (Figure 2.)

CASE II. Emma Y., aged 43, born in the United States, married, was referred to me by Dr. William Forbes, February 13, 1893, for examination on account of failing vision in the left eye.

History. — The patient had the usual exanthemata in childhood; eleven years ago had malaria, but was not confined to bed; she has had three children, two living and well; the oldest died of diphtheria. Her father and mother died of typhoid fever; the grandparents were healthy on each side; there is no history of hereditary disease in the family. In August, 1890, she first noted a lump in the left breast, which was removed by Dr. Forbes in December, 1891, and proved to be an ordinary carcinoma. There was recurrence in loco, in the axilla of the same side and also in the other breast. Both the recurrent and the new growths were thoroughly removed by Dr. Forbes in January, 1893. On November 27, 1892, she first noted, it is stated after a fright, dimness of vision in the left eye, associated with dull pain and also pain in the forehead, temples, and occiput.

Examination. — The patient is a spare anaemic woman with every evidence of the ravages of the cancerous disease which has reappeared above the left collar bone.

V. of R. E. equaled 20/20. The media were clear, the disc was a vertical oval of normal appearance, the retinal slightly hazy around its margins, but there were no abnormalities in the fundus. The refraction was hypermetropic.

V. of L. E. equaled 10/200. The media were clear, the disc was a vertical oval, of fair color, but its margins somewhat blurred by hazy retina. The macular region was occupied by a somewhat irregular growth, the summit of which was seen with 4 D., grayish in color and dotted over here and there with reddish spots. This elevation shaded gradually into the surrounding choroid without a sharp line of demarcation, being extended downward as far as it could be traced, but upward the extension was less marked. It began close to the edge of the disc apparently, and extended for a considerable distance beyond the macular region laterally. As before stated, however, the merging of the pathological area into the normal choroid was so gradual that it was impossible to discern the line of separation. The visual field was slightly contracted downward and outward and

upward and inward, and its center was occupied by an irregular scotoma characterized in its central area by dull vision, colors being badly appreciated and white appearing grayish. This area of partial scotoma communicated with the peripheral loss of vision which existed upward and inward. The patient declined operation and was not again seen. The history and the clinical signs would seem to establish the diagnosis of metastatic carcinoma of the choroid.

The literature of metastatic carcinoma of the choroid so recently has been the subject of study by C. Devereux Marshall[1] and by Felix La Grange[2], who publish almost identical analyses in tabular form, that it is unnecessary to refer to it in detail. Marshall summarizes twenty-two cases and records two additional ones, while La Grange's tables contain nineteen cases from literature and one of his own. He omits the cases of Kamocki, Wagner, Ward Holden[3], and Noyes[4], which Marshall includes, but has a reference to Samelsohn's case, published in 1891, which apparently has escaped Marshall's attention. If to these lists we add the two examples of this affection which I report, we have in all twenty-seven cases — twenty-one females, five males, and one without clinical history. The mammary gland was the region first attacked in twenty, the lungs and pleura in two, the stomach in three, the thyroid in one, while in one the original seat of the carcinomatous growth is unknown.

[1] Royal London Ophthalmic Hospital Reports, Vol. XIV, Part 3, December, 1897.
[2] Archives d'Ophthalmologie, January, 1898.
[3] La Grange considers the cases of Holden and Wagner as "insufficiently demonstrated" and therefore excludes them. Holden submitted to histological examination an eyeball which contained a carcinoma of the choroid, but the clinical history of the patient from whom the specimen was removed was lost. Wagner's patient had carcinoma of the choroid and died of cancer of the liver and stomach at a time when he was not under observation, and hence there is some doubt whether the ocular growth was primary or secondary.
[4] Dr. Noyes (TRANSACTIONS OF THE AMERICAN OPHTHALMOLOGICAL SOCIETY, 1894-96, Vol. VII, p. 538) in his resume of the literature of metastatic choroidal carcinoma includes a case published by myself in conjunction with Dr. Meigs in the American Journal of the Medical Sciences, August, 1894. This is an error, as the tumor was not a metastatic carcinoma but a much rarer growth, a metastatic sarcoma, the metastasis having taken place from a mediastinal sarcoma.

LEUCO-SARCOMA OF THE CHOROID; ENUCLEATION IN THE GLAUCOMATOUS STAGE, WITH HISTOLOGICAL EXAMINATION OF THE EYEBALL.

BY G. E. DESCHWEINITZ, M.D.,

OF PHILADELPHIA.

The ordinary pigmented sarcoma of the choroid is common, and even leuco-sarcoma is not rare, occurring, according to W. C. Rockliffe, once in eight times; but certain clinical and pathological features of interest are attached to the case which follows, justifying its record.

W. F. T., a man, aged 61, born in the United States, retired merchant, consulted me on the 9th of October, 1897, to see if any relief could be obtain for a detachment of the retina which he stated had existed in the right eye for some time.

History. — The patient had always enjoyed excellent health and had taken the best possible care of himself. In August of 1896, he contracted whooping-cough and dated his visual disabilities to a severe paroxysm of coughing during his illness. He also thought that his vision had been affected by being exposed at that time to a severe glare of the sunlight from the ocean.

Examination. — The patient was an exceedingly well preserved active man whose organs appeared to be sound. Urine examination made at a somewhat later date was negative.

V. of R. E. equaled seeing the outstretched fingers in the lower field if the head was tipped upward. The cornea and lens were clear, the vitreous slightly cloudy. There was a large detachment of the lower half of the retina extending completely to the periphery and a corresponding defect in the visual field. On movement of the eye there was distinct undulation of the detached retina, which was pushed forward into the vitreous. The optic disc could only be seen dimly and appeared to be oval and of a greenish color and contained a small cup. The tension was normal and the eye painless. The refraction of the unaffected

portion of the fundus was myopic; the patient's distance glass being 0.75 D.

V. of L. E. equaled, after correction of 1.75 D. of myopic astigmatism, 6/5. The disc was a vertical oval, of good color, containing a physiological cup. To the outer side there was a greenish broadening of the scleral ring. There were no abnormalities of the fundus or of the retinal circulation.

The patient had studied his own case with a good deal of intelligence, and wished to discuss all the arguments pro and con as to the etiology, treatment, and prognosis. Although the retinal detachment did not give the impression of one due to morbid growth, it was explained to him that this was a possibility, and as he had already tried other kinds of treatment it was further suggested that scleral puncture was advisable as a diagnostic measure, as well as a curative procedure, provided the subretinal contents were fluid. He was unwilling to make up his mind to have anything done, but promised to return the next day for further examination. Instead came a letter declining for the present to have treatment of any description, but promising to return later for further examination.

The patient was not again seen or heard from until the 18th of March, 1898, or about five months after his original visit, when a letter came stating that the vision of the right eye had gradually disappeared and that he had been totally blind in that eye since the beginning of the year. On two occasions he had had pain in the eye, accompanied by what he called "extravasations." Two weeks before writing he had taken cold and suffered somewhat from malaria. This was succeeded by intense neuralgia in the head and agonizing pain in the right eye, so great that he was obliged to allay the pain with full doses of morphia.

Suspecting that glaucoma had set in, the patient was advised to come immediately for examination. He reported on the 22d of March, 1898, with the typical appearances of secondary glaucoma: coarse bulbar injection, steamy cornea, shallow anterior chamber containing a small amount of blood, imperfect reflex from fundus, tension +1. The nature of the case, which was only too apparent, was explained to him and enucleation advised. To this he consented, and the eyeball was removed on the 31st of March and immediately placed in a 5 per cent. solution of formaldehyde. The patient recovered from the operation without incident, and when last seen, on the 25th of May, 1898, was perfectly comfortable.

Anatomical Description. — After division of the eyeball the tumor was seen to be a somewhat pear-shaped growth, resting upon a flattened base, from which it was partly separated by a marked constriction. This constriction or neck, according to Panas and Rochon-Duvigneud[1], represents the position where the tumor broke through the superficial layers of the choroidal capsule, and especially the lamina vitrea, and thus assumed the form of a hemispherical mushroom. (Fig. 1.) The color of the neoplasm was yellowish-white, and on its face a number of conspicuous vessels could be detected. The retina was completely detached except where it had become adherent to the growth when the latter first perforated its choroidal capsule. As the head of the tumor grew the retina was folded on itself and pushed in advance of it. There were no extra scleral nodules. The optic nerve was somewhat discolored upon one side.

Microscopical Examination. — All portions of the tumor, which springs solely from the choroid, are composed of small, slightly oval, perfectly typical sarcoma cells. There is no differentiated intercellular substance or pigment and no areas of degeneration. Large, thin-walled blood vessels are everywhere apparent. The rest of the eye is not noteworthy, except the angle of the anterior chamber which is closed by an adhesive inflammation between the iris-base and the periphery of the cornea. In addition, the angle is occluded by the remains of a blood-clot, which is a representative of the hyphaema existing before enucleation.

Remarks. — The chief points of interest have already been mentioned and may be briefly summarized:

(1) A myopic eye with the clinical history of ordinary spontaneous detachment of the retina.

(2) The earlier ophthalmoscopic appearances which closely simulated idiopathic detachment, and, in a degree greater than usual, obscured the diagnosis.

(3) The interesting mode of development of the growth, after rupture of the choroidal capsule and the adherence of the retina to this point.

[1] Recherches Anatomique et Clinques sur la Glaucome et les Néoplasms intraocu laires, Paris, 1898, p. 263.

FIG. 1.

Leuco-sarcoma of Choroid, showing at *a* constriction, which marks where choroidal capsule was ruptured and where retina became adherent, being pushed forward with growth of upper part of tumor (*b*), which assumes a mushroom shape. At *c* choroidal origin of growth is seen.

ANGIOMA OF THE LACHRYMAL GLAND EXTENDING TO THE APEX OF THE ORBIT; REMOVAL WITH PRESERVATION OF THE GLOBE, FUNCTIONS OF THE EYEBALL AND OF THE EXTERNAL OCULAR MUSCLES, WITH THE EXCEPTION OF THE LEVATOR WHICH WAS INVOLVED IN THE GROWTH.

BY G. E. DESCHWEINITZ, M.D.,

OF PHILADELPHIA.

Walter D., aged 18, born in the United States, unmarried, came to the Jefferson Medical College Hospital May 21, 1896, and consulted Dr. Joseph Hearn with the hope of obtaining relief from a growth which occupied the upper and outer portion of the orbit and appeared on the surface of the eyelid. Dr. Hearn very kindly referred the patient to me for treatment and operation.

History. — There is nothing noteworthy in the family or personal history of the patient, except that he was of somewhat feeble mental development and was subject to fits of depression and periods of explosive anger. The growth for which he sought relief had been noted first in early childhood; in fact, in all probability it was congenital in its origin. No similar growth had appeared in any other member of his family.

Examination. — The patient was a well-grown lad in good physical condition, all organs apparently being sound. He was somewhat morose, but very anxious to be rid of the deformity, which appeared to prey upon his mind.

Eyes. — V. of R. E. equaled 20/40 without correction. The ophthalmoscope revealed an irregularly oval disc, rather pallid in color, and an underlying conus down and in. The arteries were normal in size; the veins full, dark and slightly tortuous. There were no abnormalities of the retina or choroid.

The upper and outer angle of the orbit was occupied by a growth which spread out upon the skin of the lid, occupying its outer two-thirds and extending beyond the edge of the orbit. Over the tumor the skin was quite loose and the growth itself was of a bluish color, giving the impression that its composition

was a collection of large purplish vessels. Eversion of the lid demonstrated a similar tissue beneath the conjunctival surface, the purplish mass beginning at the edge of the cartilage and passing back to the retrotarsal fold and inward toward the orbit and outward to its external margin. In front of the ear on the same side there was a small cavernous angioma 1½ inches in length and 1 inch in width, but not communicating with the growth on the lid. Behind the ear there was a varicose vein extending along the edge of the sterno-cleido mastoid.

V. of L. E. equaled 20/40 without correction. There were no abnormalities of the eyeball or its appendages, or of the external ocular muscles.

On the 29th of May, with the kind assistance of Dr. Hearn, I dissected the tumor entirely from its bed. There was no difficulty in separating the overlying skin from the growth itself, which gave the impression of a tangled mass of large blood vessels loosely enclosed in a delicate sheath of tissue, and which passed outward and backward into the orbit, dwindling gradually to a narrow point, which was finally lost almost at the apex.

During the dissection there was little or no bleeding, but from several points of puncture a slight oozing, so that when the growth was finally removed it was in a collapsed state.

The wound on the skin surface was closed with interrupted silk sutures, that on the conjunctiva, where it had been torn in one or two places, with similar sutures. The recovery was uninterrupted and without reaction, but there was marked limitation in the movement of the upper lid, evidently due to interference with the fibers of the levator, which, as subsequent microscopic examination showed, were involved in the growth. The function of the eye and of the other eye muscles was normal. The boy was told to return for an operation to relieve the ptosis, or partial ptosis, for the lid was not entirely closed over the ball. This, however, he failed to do.

The growth proved to be of flattened triangular shape and resembled somewhat a collapsed cyst. After hardening in Müller's fluid, sections were cut by Dr. J. Dutton Steele from its base, center, and apex, and stained with thionin and eosin and haematoxalin and eosin.

(1) Sections from the base of the tumor, which had occupied a position in the upper and outer angle of the orbit and beneath the skin of the upper lid, show an external covering of loose coarse

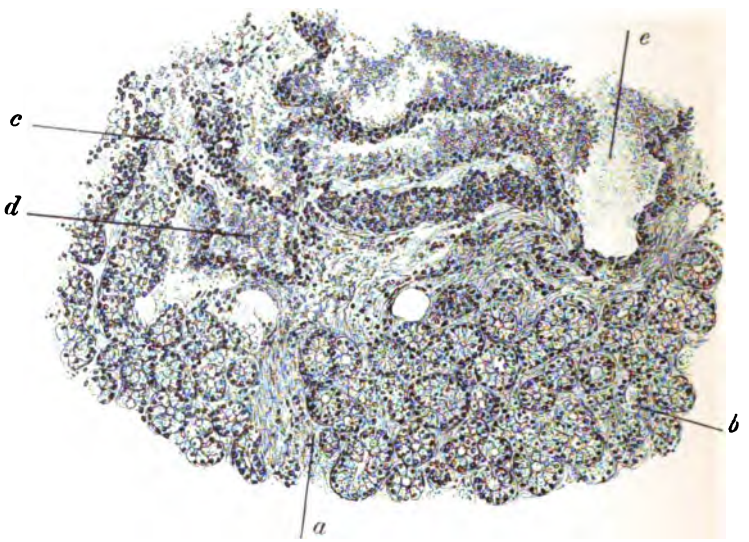


FIG. 1.

Angioma of Lachrymal Gland. (Zeiss' Ocular 4, obj. 16.0 mm.)
a, Inward prolongation of connective tissue coming from external covering. *b*, Lachrymal gland tissue. *c*, Entrance of blood between acini. *d*, Formation of a blood space. *e*, Fully formed blood cavity.

connective tissue containing in its meshes free blood corpuscles, pigment grains, granular débris, blood vessels, and nerve filaments. At intervals prolongations of this tissue pass inward toward the deeper portions of the growth. Immediately succeeding the connective tissue investment is a structure in all particulars repeating that of the lachrymal gland — acini limited by basement membrane and lined by secreting cells with granular protoplasm and conspicuous nuclei, and interacinous connective tissue. In part invading and in part replacing the glandular structure is the typical formation of a cavernous angioma — variously shaped cavities filled with blood and lined with endothelium. (Figure 1.)

(2) Sections from the center of the growth contain besides the glandular tissue and the angioma much loose connective tissue, fatty tissue, and muscle fibers, and evidently represent that part which existed in the upper portion just within the entrance of the orbit.

(3) When the apex of the tumor is reached there is an entire disappearance of the glandular tissue, and in its place we have the fully formed angioma, with large cavernous spaces lined with endothelium, separated by trabeculae composed of fibrous tissue containing numerous round and spindle cells. (Figure 2.)

Remarks. — When cavernous angioma is found in the liver the origin of its cavities in dilatation of the pre-existing blood vessels of the lobules can often be discovered. In the present growth a similar origin is discernible in some places and the dilated capillary vessel can be followed into the expanded blood space. The angiomatous process develops by an interacinous insinuation, seen in all stages from a few blood corpuscles lying between the acini to large and well-formed cavities, and as the acini are pushed aside they are mutually pressed against each other and individually compressed so that they help in the formation of the trabecular network which separates the blood-containing cavities. Under such an invasion the gland tissue gradually gives way and is finally destroyed by this cavernous transformation. (Figure 2.)

Scattered through the lobules of gland tissue are not infre-

quently to be seen small foci of deeply-stained round cells (inflammatory tissue), sometimes in connection with dilated vessels or small blood cavities. This appearance suggests Virchow's hypothesis of the formation of angiomas in glandular tissue, viz., that the first stage is not dilatation of the blood vessels, but the deposition of granulation tissue in which the vessels and vascular spaces are afterwards formed. It is not unreasonable that both methods of angiomatous formation were active in this growth.

It is probable that the angioma originally started in the tissue of the orbit (a common habitat), and that the gland became involved as a secondary result.

As the gland tissue in all particulars resembles the normal lachrymal gland and not a new formation of gland tissue, it seems more accurate to classify this growth as an angioma involving the lachrymal gland and not as an adeno-angioma.

Tumors of the lachrymal gland are not uncommon, especially adenomas and sarcomas, but an angioma of this structure is of much less frequent occurrence; indeed, it is not mentioned in most of the text-books. Von Graefe observed an angioma of this gland (clinically only) in 1866, but since then, if a somewhat hurried search of the literature may be trusted, there is little mention of the subject.

PRIMARY CARCINOMA OF THE CARUNCLE.

BY G. E. DESCHWEINITZ, M.D.,
OF PHILADELPHIA.

Tumors of the caruncle are, comparatively speaking, uncommon. Adenoma, cystic adenoma, fibro-lipoma, dermoids, sarcoma, and epithelioma have been found in this region.[1] To this list I will add the report of the following case:

A man, aged 52, born in the United States, a farmer, presented himself at the clinic of the Jefferson Medical College on April 8,

[1] Those interested in the literature of tumors of the caruncle should consult Panas, Maladies des Yeux, Tome II, pp. 301-304; Veasey, Archives of Ophthalmology, 1897, Vol. XXVI, p. 204.

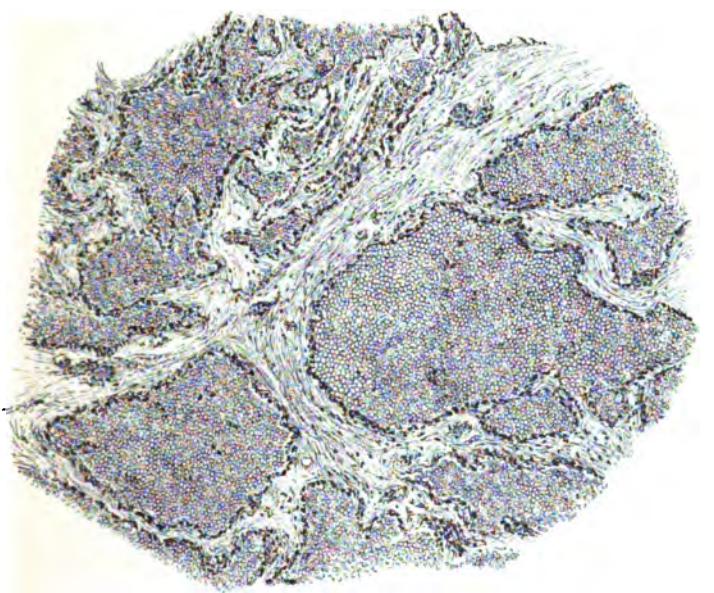


FIG. 2.

Fully Formed Angioma, From the Apex of the Growth.
(Zeiss' Compens. Ocular 4, obj. 16.0 mm.)

1898, on account of a small tumor which was evident at the inner canthus of the right eye.

From the general standpoint the man was in perfectly good condition and had always led the healthful life of a farmer. There was no history of trouble with the eyes or of injury to the affected region.

The growth, about the size of an ordinary pea, sprang directly from the right caruncle, which it practically replaced, and terminated in a slightly pediculated attachment. It was of a reddish-yellow color and had existed for a number of years, according to the man's statement and also according to the statement of the doctor who brought him. In recent times it had grown slightly and caused some irritation; therefore its removal was desirable. The growth was readily excised and the base cauterized. The patient has not been seen since this date, but as the doctor was requested to send him back if any further trouble arose, it seems unlikely that there has been recurrence.

After hardening in formaldehyde, the growth was cut in serial sections and stained with carmine and haematoxalin. It presents the following characteristics: Externally there is a covering of flattened epithelial cells directly succeeded by long tubules, or plugs of spheroidal epithelial cells agglutinated together, but not held in any capsule. Between these plugs there is a delicate stroma composed of fine spindle cells and collections of small round cells. In some places the spindles are drawn out into fibers, giving the impression of the beginning of a delicate connective tissue. In many of the plugs towards their centers are areas of degeneration which in their later stages closely resemble "concentric globules," "bird's nest bodies," or "pearly bodies," as they have been variously called. (Fig. 1.) That these areas represent collections of dead epithelial cells, which have arisen probably because of the mutual pressure of the cells one against the other, is readily demonstrable in those spots where the earliest stage of the process can be studied, and where the cells may be seen in all stages of degeneration from those which are just beginning to lose their power to accept the staining reagent, to those which are completely necrotic and are pushed aside and packed together in the concentric lamina forming the

globule. There are no blood vessels to be seen among the cell groups.

Remarks. — As the caruncle may be regarded as a portion of modified skin containing with other ingredients the so-called caruncular glands, there is, of course, no reason why a tumor of epithelial origin should not appear in this situation and have its origin in the glandular structure of the part. In the present instance, except perhaps for the epithelial covering, there is not a trace of the original caruncular structure. It has literally been replaced by the tumor formation. In some respects this growth resembles an adenoma of the caruncle, as described by T. Mitchell Prudden,[1] which consisted of a congeries of tubular branching structures having larger and smaller, mostly central, lumena, which resembled tubular follicles and were lined with cuboidal and cylindrical epithelium, but there are also evident important differences and the arrangement of the cells as seen in this growth is analogous to the cancer plugs in many of the epitheliomata.

From what has been said, however, it is evident that this growth is not *typically* epitheliomatous or carcinomatous, and perhaps might with propriety be classified with the so-called *endotheliomas*, in which the cells resemble epithelial cells, are grouped into masses and separated by a framework or stroma, and in which also nests or globules may be found. Indeed, it is difficult, if not impossible, to make an exact differential diagnosis. Against the cancerous nature of the growth may also be urged its circumscribed character, its long duration, and, so far as I know, its failure to recur. The character of malignancy, however, does not always pertain to these small epithelial tumors growing from mucous membranes or from muco-cutaneous surfaces, and they often remain stationary for a long time. It would seem that the present growth was just about to become active, as the clinical history states that it had begun to grow when it was removed.

[1] Archives of Ophthalmology, 1896, Vol. XV, p. 1.

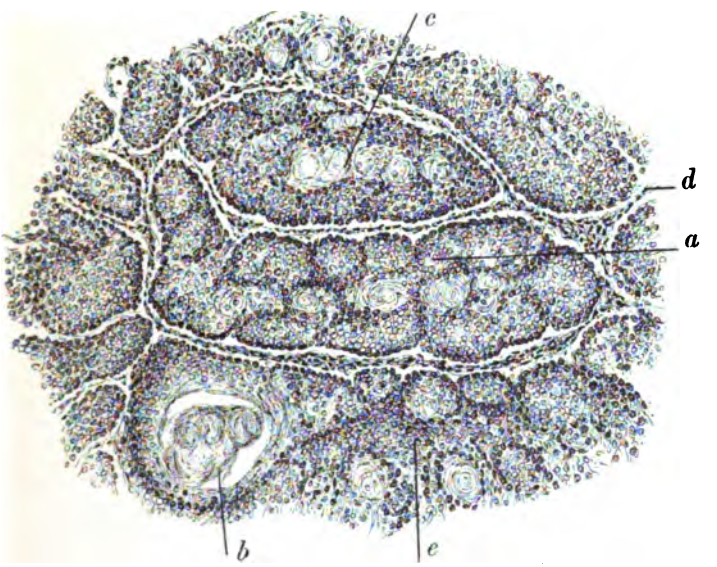


FIG. 1.

Primary Carcinoma (Epithelioma) of the Caruncle.
(Zeiss' Ocular 4, obj. 16 mm.)
***a*, Plug of epithelial cells; *b*. *c*, Concentric globules; *d*, Stroma, composed of spindle spindle and round cells; *e*, Small round cells, "indifferent tissue."**

GROWTH IN THE REGION OF THE LACHRYMAL SAC WITH THE HISTOLOGICAL CHARACTERS OF TUBERCLE.

BY G. E. DESCHWEINITZ, M.D.,

OF PHILADELPHIA.

The following case from the standpoint of histological examination is certainly of unusual and peculiar interest:

James W., aged 29, born in the United States, a paper-hanger, came to the Jefferson Medical College Hospital on the 17th of December, 1897, for relief of obstruction of the right lachrymal duct.

Examination. — The patient was a man in robust health, complaining of nothing except an excessive lachrymation which had existed for three months. There was a moderate amount of lachrymal conjunctivitis; in other respects the eye was normal. The canaliculus was divided and probes passed in the ordinary manner. The patient continued to visit the dispensary from time to time, and although the probes entered freely, the epiphora continued.

In the early portion of 1898 my assistant, Dr. Veasey, noticed that when a probe was passed a swelling appeared in front of the lachrymal sac, especially when the probe was pressed forward. This swelling, about a centimeter in length, gave the impression to the palpating finger of a small tumor; for example, a sebaceous cyst, which seemed, if not actually in association with the lachrymal sac, at least to lie close to it.

Thinking that this growth might be the cause of the continuous obstruction, I advised its removal. Consent was given, and on the 25th of February, 1898, I dissected the small tumor from its bed. It was about eight millimeters in length and half as wide, somewhat pear-shaped, of a grayish yellow color, imbedded in the fibers of the orbicularis and terminating in a somewhat conical end which passed toward the lachrymal sac, but was not actually attached to it.

The wound was closed with a few interrupted sutures and healed promptly and without reaction. The patient was seen

from time to time, a No. 7 Bowman probe passed on each visit, and in a very short time the lachrymation disappeared. The patient has not visited the dispensary since the early spring, as the complaint for which he came had been entirely relieved. The growth was placed in a 5 per cent. solution of formaldehyde and submitted to microscopical examination with the following result:

The growth is partly surrounded by and is partly within the muscle fibers and their associated fibro-fatty tissue, and, in general terms, is composed of cells of various kinds and sizes: lymphoid cells, polynuclear leucocytes, epithelioid cells, oval granular cells, and giant cells, all lying in a faint stroma, which does not assume a positive reticular form. Blood vessels, at least new-formed ones, are absent.

More particular examination shows that this tissue tends to assume a definite formation composed of minute nodules or tubercles, as follows: The nodule is circular or slightly oval in shape and is surrounded by muscle fibers. In its periphery the cells, usually lymphoid, are more closely aggregated than in the intermediate and central parts, where, in addition to these cells, other varieties — oval, spindle, and epithelioid in type — appear, while scattered through the nodule are giant cells, not only centrally but also peripherally situated. As many as a dozen giant cells may be counted in a single nodule. (Fig. 1.) In place of this arrangement in other portions of the section the tissue is composed of a nearly uniform expanse of small, deeply-stained cells resembling the so-called tuberculous granulation tissue, but even within this tissue it is usually possible to recognize the tubercles by the presence of the epithelioid and giant cells. While there is no nodule which exhibits caseation of its center, spots appear here and there which suggest beginning degenerative changes.

From what has been said it is evident that the growth under consideration has the usual composition of tuberculous tissue, and under the microscope does not much differ in appearance from miliary tubercle, for example, in the lung, except in one im-

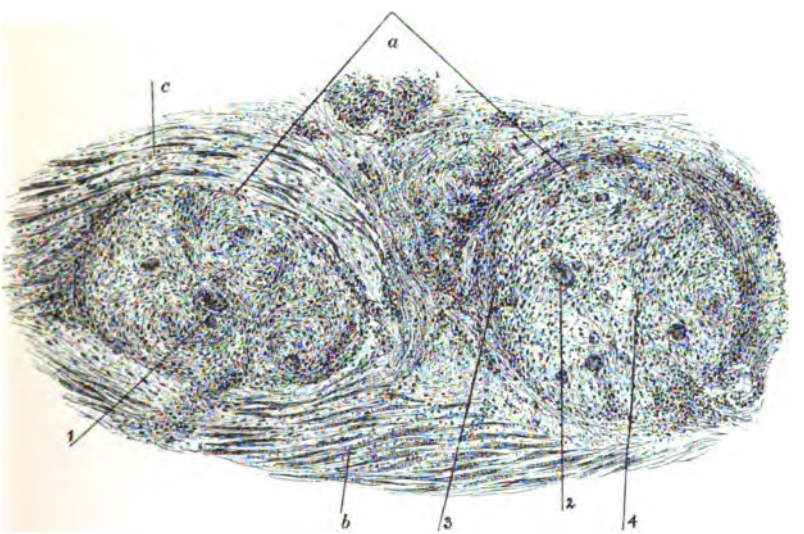


FIG. 1.

Prelachrymal Tuberculous Tissue. (Zeiss' Ocular 8, obj. 16 mm.)
a, **Small tubercles, containing: (*1*, *2*) giant cells, (*3*) lymphoid cells, (*4*) epithelioid and oval granular cells.** *b*, *c*, **Muscle fibres.**

portant particular, the absence of tubercle bacilli, which numerous (18 slides[1]) careful examinations by Dr. Steele have failed to detect.

Remarks. — It is scarcely necessary to point out that epithelioid cells and giant cells are not, as was once maintained, characteristic of tuberculosis, inasmuch as they may be found in inflammatory tissue-formation or granulation-tissue, although in the latter, as Ziegler says, "the multinuclear cells occur but sparingly, while in tubercle they are in great numbers and highly developed." At the same time there was nothing connected with this growth to suggest inflammatory origin or the presence of granulation tissue. It was a definite oval growth of grayish color, made up of non-vascular cellular nodules which from the histological point of view repeated the structure of tubercle, and it is difficult to divest one's self of the belief that the tissue is not tuberculous in spite of the absence of the bacillus. If one asks what could have been the origin of the virus which caused this subcutaneous or rather intramuscular nodule in the absence of signs of cutaneous inoculation or neighboring lymphatic involvement, the lachrymal sac, or, rather, the lachrymal passages, at once suggest themselves. While the tumor did not penetrate the sac or involve it, it was in immediate connection with it, and it is conceivable that this should be regarded as the source of infection.

Independently of the interest which attaches to this small growth on account of its resemblance to tubercle, if it is no more than a resemblance, is its situation.[2] Prelachrymal sac-disease is never common. We are accustomed to observe abscesses in this situation associated with caries of the lachrymal bone, either as the result of injury or from syphilis, and cysts are also described, but a solid growth of this character is new to me, nor have I noted anything like it in literature. Of course, it must not be confounded with the growths which appear in this region and have their origin in the lachrymal sac.

[1] The fact that in 18 slides bacilli were not found does not prove that they were absent; the nidus, if it existed, might have escaped the search.

[2] It may be asked why inoculation experiments were not performed to establish exactly the identity of this growth. The possible tuberculous nature of the neoplasm was necessarily never suspected from clinical signs, and hence there was no thought of such experiments; later, after hardening, etc., they became impossible.

DISCUSSION.

DR. B. E. FRYER, Kansas City. — I would like to ask Dr. deSchweinitz if, in the microscopic examination of the carcinoma, he found the so-called coccidia? In these two cases it would be interesting to know whether they played an important part in the original growth and in the metastatic recurrence.

DR. DESCHWEINITZ. — I did not make an examination of the original growth; it was an ordinary scirrhus of the mamma. No special examinations to demonstrate coccidia in the metastatic growth were made. Personally, I have no faith in the etiological relationship of coccidia to carcinomatous disease.

DR. C. S. BULL. — The case of prelachrymal growth was interesting to me because I had a case last spring which was almost exactly like it. In that case I operated as Dr. deSchweinitz did, supposing I had a prelachrymal cyst, but on incising it it proved to be solid and showed a structure almost exactly like this one of Dr. deSchweinitz. I had it examined for tubercle bacilli, but nothing was found. The child had no symptoms of general tuberculosis, though its appearance was that of a pulmonary tuberculous patient.

REMARKS ON CASES OF HIGH MYOPIA — REPORT OF ONE CASE SUBMITTED TO OPERATION BY REMOVAL OF BOTH CRYSTALLINE LENSES.

BY HENRY D. NOYES, M.D.,

NEW YORK CITY.

A special interest attaches to cases of high myopia since the proposal of Fukala in 1887 to treat them by removal of the crystalline lens.

The reasonableness of the proposal in a purely optical sense is sufficiently obvious. But other considerations of serious importance have led to a disinclination to enter upon a proceeding respecting which clinical experience is as yet very incomplete, at least in this country. How far operative interference may dam-

age an eye which is the seat of choroidal changes is the problem to be solved. Experience of Sattler and others related at the Heidelberg Congress seemed to show that the risk incurred is not great; yet one hesitates to advise operation when the dangers of intra-ocular hemorrhage have to be reckoned with. Spontaneous hemorrhage is not infrequent and low grades of cyclitis are very apt to ensue upon the usual corneal section for extraction. How far this can be guarded against by antiseptic precautions remains to be seen, but a sudden lowering of tension is certainly fraught with danger. This peril was fully realized in a patient whose case I reported in 1896, in whom intra-ocular hemorrhage entirely destroyed sight.

In reviewing the records of 1,738 cases of myopia and myopic astigmatism, I find 132 with error no greater than 10 D, being a percentage of 7.6. If the normal axis be taken at 22 mm., all the above cases will have an axis larger than 25.8, and a corresponding attenuation of the membranes at the posterior pole. The ophthalmoscopic picture presents circum-optical atrophy and choroidal lesion at the macula, with deposits of pigment and not infrequently blotches of hemorrhage.

Visual acuity is necessarily reduced by the optical conditions — but it falls below the optical requirements in almost all cases. In few instances is it better than 0.4. I find four cases with V. = 20/30 and this standard maintained for from ten to twenty years. In them there is very little circum-optical atrophy, but rather a general distension of the fundus. In some instances the myopia is monocular, and this certainly excludes active influence of muscular compression as an etiological factor.

A very serious question in this connection is whether detachment of the retina is likely to be promoted by an operation. It seems pretty well established that this accident is less likely to take place with extreme myopia than in the minor degrees. I have records of 76 cases of retinal detachment and 34 were myopic. In one the error required a lens 2½ inches focus, while the remainder were in degree below 8 D.

It is not claimed that the progress of myopia is hindered by

operating, while a few cases show that no influence is exerted for better or worse.

It is agreed that it is best not to operate on persons above forty years old, and that the limit of M. most desirable is 16 D. The optical effect is not absolutely uniform. The beginning of sclerosis in the lens is the objection to discision, and in some instances this condition increases the myopia.

The case which I beg leave to report is as follows:

Irene D., æt. 2, seen first September 9, 1889, and then the eyes were declared slightly myopic and there was converging strabismus which had existed six months and was alternating. In 1895 had been wearing — 3 D. for about two years, and by ophthalmoscope the fundus could be seen with — 13 D., revealing diffused stretching of membranes without choroidal atrophy. Under atropine, O. D. — 12 D. V. = 0.1. O. S. — 12 D. V. = 0.2 +. In April, 1896, myopia corrected by — 13 D. It was decided to get rid of the left crystalline by discision with two needles. This was followed by linear extraction one week later and it was attended with only slight reaction. A pretty dense capsular membrane ensued, which was divided by a narrow Graefe knife in October, 1896. The corneal wound was inadvertently made too large and into it the iris prolapsed, and though replaced with a fine probe, a slight coloboma remained and an oblique astigmatism was produced. In December, 1896, notwithstanding some floating material in the vitreous, the fundus could be well seen with + 5s. The vision with + 3.00s ⊂ + 2.00c 90° = 0.4. The converging strabismus continues, but the operated eye is now used in preference to the other. For reading she takes + 6.50s ⊂ + 1.50c 90°.

In August, 1897, the right eye was submitted to treatment — the lens capsule opened with two needles. Free swelling of lens with slight reaction took place. Some iritis with adhesion followed and the lens was left to spontaneous absorption. In February, 1898, did capsulotomy with two needles, securing a clear pupil — fundus seen with + 6s. A little choroidal atrophy alongside the nerve. O. D. with + 5.00s. V. = 0.2. Abundant

pigment in streaks and masses and general thinning of choroid around macula.

The interesting features of this case are the early occurrence of converging squint; that a rapid development of myopia occurred between six and eight years of age; that the removal of the lens produced a change of 16 D., and with it an improvement of vision to double the previous condition; that binocular vision was not secured by the refractive changes, and that diplopia was never observed.

At the international ophthalmological congress in Edinburgh, 1894, this subject was summarized and reports given of 209 operations, the chief communications being by Dr. Thiers of Aachen and Dr. Fukala of Pilsen, who lays stress on posterior choroiditis as a contra-indication to operation.

A CONTRIBUTION TO THE SURGICAL TREATMENT OF EXCESSIVE MYOPIA, WITH REPORT OF AN ADDITIONAL CASE.

BY WILLIAM HOLLAND WILMER, M.D.,

WASHINGTON, D. C.

While this operation has been performed very frequently abroad, unfortunately the refraction before and after the operation has not been carefully stated. Hence it is very difficult to estimate from the statistics just how much myopia is usually relieved by the extraction of the lens, or the amount of improvement in visual acuity. From the reports of operators abroad, the change in refraction varies from 11.50 D. to 24.0 D.

In the *Ophthalmic Record* for February, 1898, Dr. Jackson reports two cases. In discussing Dr. H. Harlan's paper entitled "Contribution to the Question of Removal of Lens in Myopia" (Transactions Section on Ophthalmology, American Medical Association, 1896) Dr. Casey A. Wood reports one case, a girl of

seventeen, where the transparent lenses had been removed by discision and subsequent extraction.

The refraction was: R. E. V. = 7/200; w. S. — 14.0 D. = 20/100; L. E. V. = 8/200; w. S. — 15.0 D. = 20/70. After the operation: R. E. V. = 20/200; w. S. + 4.0 D. ◯ C. + 0.50 D. ax. 90°. = 20/50; L. E. V. = 20/100; w. S. + 2.50 D. ◯ C. + 0.75 D. ax. 90° = 20/50.

In the *Archives of Ophthalmology* for January, 1898, I published a case. Here Javal showed a corneal astigmatism of 2.75 D. with the rule. Under a mydriatic, the refraction was R. E. V. = 1/200; w. S. — 25.0 D. ◯ C. — 2.50 D. ax. 10° = 20/100, L. E. V. = 3/200; w. S. — 17.0 D. ◯ C. — 2.50 D. ax. 180° = 20/50 —.

After the operation Javal showed an astigmatism of 1.25 D. with the rule. R. E. V. = 20/200; w. S. — 2.50 D. ◯ C. — 1.0 D. ax. 180° = 20/50 +. Ordinary print could be read with great ease at ten and a half inches. In this case, the myopia was decreased by 22.50 D. and the astigmatism by 1.50 D. I have just operated upon the left eye, but have not yet needled the opaque capsule.

To add to these statistics, I report briefly another case that I have recently operated upon. In these cases, I have taken the greatest care in order to make the findings as accurate as possible. The tests were repeated, with and without a mydriatic, and the eyes were examined with Javal's ophthalmometer, by skiascopy, test lenses, stenopaeic slit, and ophthalmoscope.

Mr. C., aged 33, an employé of the Bureau of Printing and Engraving, consulted me on December 15, 1897. Javal showed in each eye a corneal astigmatism of 1.25 D., axis of cylinder 165°. Under a mydriatic, the refraction was R. E. V. = 1/200; w. S. — 22.50 D. ◯ C. — 0.75 D. ax. 180° = 20/70 —; L. E. V. = 1½/200; w. S. — 21.0 D. ◯ C. — 0.75 D. ax. 180° = 20/50 —.

In each eye there was a large plaque of choroidal atrophy around the disc, with small spots scattered about the fundus.

On January 4, 1898, the lens of the right eye was needled with a Bowman's needle, after the pupil had been thoroughly

dilated by atropia. For twelve hours after the operation the pupil remained much contracted in spite of frequent use of atropia. Ice applications and atropia were ordered.

January 5th. Pupil dilated, lens thoroughly opaque, no reflex from fundus, swelling of lens moderate, some pericorneal injection, anterior chamber deep, no pain. Tn.

January 9th. (Five days after needling.) Only narrow rim of iris visible, opaque lens-substance occupying whole of anterior chamber, slight irritation T. + 1. The opaque lens was extracted without iridectomy. The incision with a Graefe knife was made above in the cornea about 2 mm. within the sclerocorneal margin.

A large amount of the lens-substance presented itself at the completion of the section. There was no prolapse of the iris. Just after the toilet of the eye was completed, the patient complained of feeling nauseated, drew a long breath, and looked forcibly down, thus causing about two drops of vitreous to escape. A 10 per cent. solution of cocaine and a 1/10 per cent. solution of eserine were instilled and both eyes bandaged.

January 11th. As the eye was perfectly comfortable, the bandage was not removed for forty-eight hours after the operation. The pupil round, no prolapse of iris, atropia instilled.

March 8th. Recovery normal. The patient has been at work for a month, not using his right eye, however. Eye free from irritation. Pupillary area filled by opaque capsule except at upper portion. R. E. V. = 20/200 without a glass. Discision of capsule with Knapp's needle knife. No undue reaction followed this procedure.

April 12th. Pupil perfectly round, also black with exception of a small piece of capsule at lower portion. Javal showed no astigmatism. S. = 20/100 +; w. S. + 1.25 D. = 20/50 +.

Principally for cosmetic purposes, I needled the remaining portion of the capsule.

Considering the fact that the final refraction was reached before the last needling (which changed the refraction merely by

causing corneal astigmatism), we find that, in this case, the myopia was decreased by 23.75 D.

June 11th. Javal showed an astigmatism with the rule of 2.50 D. axis 120°. The refraction was R. E. V. = 20/70; w. C. + 2.50 D. axis 120° = 20/30 —.

The experiences of others on record, together with my own observations, lead me to believe that the ten and twelve-fold improvement in the visual acuity, often quoted as the result of the operation, would not be so great if the refraction had been carefully determined beforehand.

In Dr. Jackson's cases, which were most carefully tested, there was an improvement in one eye of a little over three-fold, in the other eye a little less than three-fold. In my first case the operation resulted in an increase in sight of a little over two-fold, in my second a little less than two-fold.

The statistics of the operation in this country are too limited as yet to be of much value in regard to the percentage of failures.

In addition to the usual explanations of the improvement in visual acuity, that is, the enlargement of the retinal image, the increase of illumination, and the improvement in the function of the retina by exercise in distant seeing, etc., I believe that the removal of the two refracting surfaces of the lens and the irregularly refracting body, the lens itself, to be one of the chief factors in this improvement. This, I think, is more true of the most excessive cases, such as 25.0 D. and over.

In regard to the mode of operation, I prefer a preliminary discision, making a small opening in the anterior capsule, followed within six days by extraction. While syringing of the anterior chamber is useful in removing the cortex, it is not essential, and it is apt to increase the irritation. One or two discisions with a Knapp's needle knife seem to me better than excessive zeal in trying to make a too complete toilet at the time of extraction.

As to the amount of myopia which offers the best operative result, the ideal case seems to me to be not the one where emmetropia would result, but one where there would still remain 2.0 D. to 3.0 D. of myopia. In such cases, the most useful vision without glasses ensues. This applies to the more intellectual as well

as to the laboring class. For instance, in my first case, a schoolteacher, there remained a myopia of 2.50 D. This patient is not at all dependent upon her glasses for any practical purposes. For without a glass she sees her pupils quite well in the distance, and can read any print at ten and a half inches.

Therefore, I should say that a myopia of about 25.0 D. is the ideal amount for offering the best *practical* results from operation.

DISCUSSION.

DR. H. D. NOYES. — My experience with this one case which I have reported showed me that the child, when free from myopia, appreciated very highly the improvement in sight in the operated eye. After the operation she had a myopia in one eye of 13 D^s. and a hypermetropia of the other about 5 D^s., and when she went without glasses she relied upon the latter for distant vision and when she wanted to read it was always the hypermetropic eye upon which she depended. She herself came to the operation with a great deal of willingness. I conceived it to be a peculiarly favorable case, because I had observed the myopia for a number of years, knew how rapidly it was increasing, and the child was young. There was a strabismus, too, that eliminated the possibility of binocular vision. I thought I should get by the operation a condition of emmetropia, but the change in the eye amounted really to 16 D.

I think if we take the cases of 13 D. and above, we are justified in proceeding to the operation in young subjects. There are some operators who perform extraction of the lens pure and simple. I should be unwilling to do that and prefer discision first and extraction later. In the large proportion of cases we read of, one eye only has been operated upon, the majority of people being satisfied with the vision they gain in that eye. If we should limit the operation to cases above 25 D., we encounter so much choroidal trouble that we should incur great risks.

DR. F. C. CLARK. — I would like to ask Dr. Wilmer why he discriminates against syringing the anterior chamber in these cases more than in ordinary cataract cases? I should judge the lens-substance retained in these cases would be more objectionable than the retention of ordinary degenerated lens-substance.

DR. WILMER. — I simply object because it adds one additional source of irritation. In my last case I had some slight iritis after syringing, and I think it is unnecessary.

THE SURGICAL TREATMENT OF EXCESSIVE MYOPIA.

BY DR. ROBERT SATTLER,

CINCINNATI, OHIO.

It was my intention to withhold, for the present, the report of this case and to include it, later on, with others which might be added, after additional experience with the surgical method for high myopia had been acquired. If I am led to mention it briefly at this meeting, it is with the hope that it may encourage others, as it has me, to give to this method more deliberate and considerate attention and to seek opportunities to put it to the test in suitable cases. It is a subject which must and should have, for all of us, an absorbing interest.

The most gratifying results following double extraction of immature senile cataracts, or sclerosis of the lenses, were observed many years ago in two old persons, both excessively myopic. The one, an old man, who formerly, or since his earliest manhood, wore — 10 D. Sph., was able after the operation to dispense with distance glasses and to resort, for reading only, to +1.75 D. Sph. The other patient, formerly was aided by —16 D. Sph., but even with these she was not able to see for twelve or fifteen years before the operation as distinctly as she saw afterwards without any glasses or with —1.25 D. Sph. She could read without the assistance of lenses.

These two cases and a visit to the clinics of Halle and Vienna in 1895, determined me to seek and to find the necessary opportunities to test this method in favorable cases on my return to this country. But in private practice, and even at my hospital and dispensary clinics, so many difficulties were encountered among the few cases which were considered favorable for the operation, that during the intervening period only four were discovered. These were with difficulty only persuaded to have the operation performed.

So far as concerns this report of the last case, the question

whether it was really one of excessive axial myopia suggested itself to me at once, after the favorable outcome of surgical interference was disclosed. Before surgical intervention it certainly had to be classed with those of excessive myopia. It presented all the clinical and ophthalmoscopic characteristics of these cases.

The patient was practically blind without the assistance of strong concave lenses — 16 D., which afforded her vision of 0.2 — only. She was not able to read without the aid of these same strong lenses, but with so much difficulty that she was unable to attend school or acquire an education, much to her own sorrow and that of her mother, an exceptionally intelligent woman.

There were no uncommon ophthalmoscopic evidences, the refractive media were found clear, and the cornea, on examination with the astigmometer, also free from marked irregularity of curvature. She was regarded as amblyopic in addition to the high myopic deformity.

It is evident that cases of congenital malformation of the lenses with preservation of perfect transparency, but with changed indices of refraction of different sectors, must necessarily be classed with those of excessive myopia, owing to their inseparable resemblance, and for the latter as well as the former, surgery alone affords relief. It is equally certain that in these exceptional ones the results of surgical treatment will be more favorable.

It would appear, however, that in this country there exists a marked scarcity of those cases of excessive myopia, among which must occasionally occur just such a one as the present, in which surgical interference, having for its purpose the removal of the lens, is indicated. This method has, as we know, been practiced on a large and successful scale in Europe.

We cannot, even at our clinics and hospitals, command our patients as is done abroad. Lengthy explanations are necessary to gain for surgical treatment the consent of patients or that of their parents, and this, to many surgeons, is an irksome task. It may have happened that those cases which yielded to the advice and submitted to the operation were not as gratifying in their final results as was expected. These are among the probable ex-

planations, and rather point to a lack of opportunity than a lack of interest for this comparatively new surgical departure. From a limited experience, I take the history of this recent and last case.

Bessie S., æt. 16, Cincinnati, O. Had been under my observation since early childhood. Her's was regarded as a case of congenital myopia associated with a high degree of amblyopia. She had two brothers; both were excessively myopic, but the amblyopia did not appear so pronounced. Her father had a slight hypermetropic error, but his eyes were healthy and vision perfect. Her mother had compound myopic astigmatism, but with corrective lenses, vision was excellent. Her maternal grandfather was myopic and also three of her aunts. At the age of eight she was given — 12 D. Sph., after a careful test and ophthalmoscopic measurement, and as nearly as could be determined she had a vision of about 0.1. Ophthalmoscopic examination disclosed only such changes at the posterior pole common to the myopic structure with healthy and transparent dioptric media. Last year, under atropine, a careful re-examination of the refraction was made, and also of the media and internal structures, lest the presence of a possible lenticonus or other lesion of the dioptric media or fundus might have eluded discovery. The results of former examinations were confirmed, nothing new developed, and only a higher correction, — 16 D. Sph., which afforded her almost 0.2 vision with either eye, was prescribed. About this time the operative treatment of myopia was explained to her mother and strongly urged and advised by me, and, after much hesitation, consented to.

The treatment by subsequent discisions, after the first traumatism resulting in cataract was inflicted, proceeded uneventfully and effected in both eyes complete absorption of the lenses. It was expected that the refraction would remain more or less myopic after complete recovery had come about, owing to the apparently high degree of the error, but tests proved the contrary. July 2, 1898, with + 4.5 D. Sph. V. = 0.6, R. E., and + 5.0 Sph. ◯ + 1 D. Cy. I Aug. 70, L. E., V. = 0.6. Corresponding lenses were prescribed for distance, and in addition —3.5 D. Sph.,

one-half size lenses in grab-frames, to be worn over her distance glasses for eading and close work. With their assistance she reads, at good range, without difficulty, — Snellen, I.

THE SURGICAL TREATMENT OF KERATO-CONUS.

BY DR. ROBERT SATTLER,

CINCINNATI, OHIO.

Some years ago I began a study of this congenital deformity of the cornea, together with a search of the best surgical intervention for those cases of double kerato-conus in which all other methods of treatment, as well as optical aid, afforded unsatisfactory or no relief.

In the selection of cases care was exercised to include only typical examples of this uncommon affection in which there was little or no question concerning the congenital origin. Those cases were excluded in which this was in doubt, or if it could with reasonable certainty be assumed that antecedent disease of the cornea, conjunctiva, and other structures had existed.

The common experience was soon shared, that the various and vaunted methods of treatment were either found wanting entirely or at least proved themselves, after faithful trials, unsatisfactory.

The experience gained, even from the earlier cases, forced on me the uselessness of most methods of treatment and other accessory measures, viz., absolute rest of the eyes, avoidance of all violent physical exertion, prolonged use of atropine, the use of compress-bandage alone or combined with eserine instillations, attention to the general health either by change of climate, occupation, or medicinal treatment, etc.

It was found, moreover, that only through the aid of corrective lenses, assisted in most instances by stenopaic appliances, could effectual assistance be rendered. This, again, could

be done in those cases only which remained stationary or were slowly progressive after an interval of several, or even many, years —and in those exceptional instances in which a rapid progression mysteriously starting was spontaneously arrested. Although the benefit from lenses in the progressive cases is only transitory, it is the only means by which better vision, and often, also, greater comfort, can be secured, thus enabling the patient to use his defective sight to the best possible advantage.

It is also surprising that one often finds that the aid which lenses afford, in raising vision to a definite numerical standard, is insignificant or not evident at all, or the combination of lenses required seems to be an impossible one; nevertheless, the patient expresses himself pleased, and proves the expediency of selecting just that particular combination by its continued use.

Mydriatics, homatropine, atropine, etc., were resorted to *in* all my examinations to render the investigations as complete as possible. In the final selection of lenses, however, I was invariably governed by empirical tests made when the eyes were in their normal state. Such tests, to be satisfactory, require the most deliberate and painstaking attention. The rule, which appears to be one of general adoption, is to prescribe any lens or combination of lenses which may, after a trial, aid the patient's defective sight or add to his comfort in the use of his eyes. In most cases, lenses may be advantageously supplemented by stenopaic devices. In some instances, the latter may afford assistance when lenses do not.

The inefficiency of the various methods of treatment and the unsatisfactory relief so far even as lenses are concerned, led to a more careful study of the different surgical methods at our disposal.

We know nothing definite of the pathology of this congenital lesion or malformation of the cornea. What we do know, clinical observation and experience gained from surgical intervention have taught us.

Kerato-conus is like the higher degrees of myopia and kerato-globus, a congenital deformity. It affects the anterior pole of the

eye, the central and immediately adjacent regions of the cornea being usually involved. In most instances, the disease affects both eyes.

It may remain stationary for life. In certain cases, however, this conical deformity, or, as it has also been aptly described, staphyloma pellucida, develops, as the result of mysterious local causes (whether suddenly or insidiously, is not known), a tendency to progression.

A remarkable and fortunate feature connected with this progressive increase of the deformity is, that in a certain number of instances, in which the tendency shows itself, it is spontaneously arrested, after a variable period lasting months or years. In such cases, a fraction of available vision may be preserved. In a smaller proportion the deformity, unfortunately, advances steadily, and, in consequence, vision becomes hopelessly disordered, and the eye or eyes, for all practical purposes, useless.

For the latter, and smaller contingent of these uncertain progressive cases, surgical interference must be considered a justifiable and necessary venture.

There is both mystery and uncertainty concerning the alleged local and general causes, as well as concerning the time of life during which this tendency may come about. There is also much speculation as to whether the general causes which affect the nutrition at large (in particular, chlorosis, pernicious anaemia, tubercular and marasmic tendencies), or the inherent latent local ones, are the more responsible factors for the destruction of sight due to an increase of this congenital deformity which up to this period has remained inactive or stationary.

It is supported by the cases under observation that the tendency to progression develops, in the majority of instances, between the twelfth and twenty-fourth year, although in one case it was delayed until the thirtieth year. It was also found that the deformity is more frequently met with in women; of eleven cases which furnish the material for this clinical study, only two were males.

It was impossible to determine whether the general causes

were more than associate disturbances. In two cases, both young women, protracted ill-health was present. In both cases, it was certain that this influenced unfavorably the progression of the ocular deformity.

A study of the cases under observation upholds a clinical resemblance to kerato-globus. Still, distinctive differences separate the former from the latter, even more unfortunate lesion. A congenital origin must be assigned to both, but the subsequent course is different. Kerato-globus, buphthalmus, and excessive myopia, are recognized more readily during the earlier months or years of life, because of the more striking deformity and, in most instances, abnormal dimensions of the globe. These congenital malformations are furthermore characterized by the subsequent pathological changes which invade such eyes and terminate in optic nerve atrophy and excavation, under the clinical picture of chronic glaucoma, hydrophthalmus, detachment of the retina, etc.

In kerato-globus, as has been stated, the principal disturbances due to defective and disordered vision, occur before the tenth year, although the graver complications may be delayed until after the thirtieth year. With typical cases of kerato-conus this is different. The malformation of the cornea is often not recognized before the tenth year, and in many cases it is not discovered until unmistakable progression with increasing failure of vision has resulted. It was during the period following puberty, or between the twelfth and twenty-fourth year, that the disturbance became marked in the cases under observation. Functional distress was pronounced and persistent in some of the cases, but serious complications of the optic nerve and retina, glaucoma, hydrophthalmus (such as occur in the allied affections of kerato-globus, etc.), did not manifest themselves.

A complication confined to one case was abrasion and ulceration of the prominent apex of the deformity, arising from traumatism, exposure, or irritating atmospheric causes. Another case complained that every prolonged effort of the eyes produced excessive muscular weariness and that the prominence of the cornea impeded the movement of the lids.

In five out of eleven cases of congenital kerato-conus, surgical intervention was advised and practiced only after all other methods had been tried and lenses and stenopaic appliances had been discarded as useless, and the patient, in consequence of the uncontrollable progression and its attending blindness, was reduced to a state of helplessness—in other words, when vision was so reduced that even with the best optical correction and stenopaic appliances less than 0.1 could be claimed and the reading of the large type was no longer possible even at the closest range.

The surgical treatment of kerato-conus, which has for its purpose to bring about an arrest of the increasing deformity, and also the possible betterment of sight, is, in every instance in which it can be considered, a justifiable intervention. It is, however, a tedious undertaking, beset with dangers and difficulties. Nor is the object accomplished in all cases by one method or by surgical interference on the part of the cornea alone, but this must often be supplemented by operations on the iris and lens.

It is a question of choice, which experience only can determine, which one of the several methods shall be selected for the most important interference, so far as the deformed cornea is concerned — whether it shall be cauterized, partially excised, or abscised with the knife. The supplementary surgery on the part of the iris or lens is of little concern compared with the probable dangers so far as the cornea is concerned.

If the selection of one or the other methods depends on preference without previous experience, that one which involves the least traumatism should be selected.

In five out of the eleven cases which furnish the material for this contribution, the methods resorted to were as follows:

I. Partial abscission of the pellucid cone without penetrating through the thickness or thinness of the cornea.

II. Crucial excision of narrow wedge-shaped pieces of tissue from the prominent central region without penetration.

III. The placing of a number of intersecting (stellate) linear excisions through the ectactic region.

IV. One or other of the first three methods, supplemented

by tapping of the anterior chamber with the hope of securing a firmer scar.

V. Simple iridectomy with and without interference on the part of the cornea, tatooage, but without excision of tissue.

VI. The use of the galvano, or actual cautery, or the cauterization with escharotics.

VII. Supplementary operation on the iris: iridectomy, iriden cleisis, for optical purposes only.

VIII. Supplementary operation on the part of the lens, in those cases complicated with high myopia.

IX. Supplementary operation on the part of the cornea: tatooage.

Of these various methods, separate and combined, partial abscision of, and placing of linear intersecting excisions through the pellucid ectasia without opening the anterior chamber, accomplished in my cases the desired object with the least traumatism, and secured the firmest scar without too great a loss of time. The average time in which this was accomplished was eleven months. In every one of the cases, one eye was selected for surgical treatment.

Cauterization with the greatest caution, in those cases in which it was tried, was more tedious and unsatisfactory. This was due to the almost uniform occurrence of necrotic changes which invaded the injured area and left the eye irritable for months and unnecessarily delayed other interference. This applied in particular to the escharotics, lunar caustic, etc., and to the most discriminate use of the actual and galvano-cautery as well.

An iridectomy was necessary in most cases for optical purposes. It was found really essential that destruction and cicatrization should embrace also the regions nearer the central ones, in order to secure greater tissue-firmness and resistance. This necessarily resulted in a larger central scar.

Tapping of the anterior chamber through the deformed region from which the tissue was abscised or excised was found an unwise supplementary measure.

The following brief reports of cases furnish evidence that surgery was adopted as a last and necessary resort, and in two cases only, both desperate ones, was it rewarded by a favorable outcome.

CASE I. Miss Eloise K., Lebanon, O. In this patient, a young woman, æt. 19, useful vision was restored in both eyes. Until surgical interference was resorted to, she was helpless and her sight reduced to 5/200 in the right eye, and 6/200 in the left eye. Formerly, lenses had afforded some relief, but these, as well as stenopaic devices became useless and were discarded. She had been under observation for two years, and during this time every available method of treatment, general and local—eserine, compress-bandages, absolute rest, repeated adjustment of lenses, stenopaic appliances—were faithfully tried, only to be abandoned as useless.

The history conclusively upheld the congenital origin. At the age of twelve, lenses were given her which brought the sight of her better (left) eye to 0.4, and 0.3 in the right eye.

She was enabled with much difficulty to complete her education. During the last two years, however, vision commenced to fail rapidly with a visible increase of the pellucid staphyloma on both eyes. The only complaint was the confusion which light produced, nor were there any evidences on the part of the internal structure which might suggest any other pathological condition except the visible one of progressive increase of the central ectactic area of the cornea. The patient's health about this time began to break down; she was anaemic, and it was feared that a tubercular tendency was about to manifest itself.

A change of locality brought with it no improvement in the general health, and she returned for advice more than ever concerned about the increasing failure of sight and the marked progression of the pellu-ectasia of the cornea. She was no longer able to read the largest type and could not move about without an attendant.

In spite of the disturbed state of her general health, surgical interference was advised as an imperative necessity. The more

imperfect (right) eye was selected and a small iridectomy performed downward and inwards; after an interval of several weeks, abscision of the conical protuberance of the cornea, without penetrating the thickness, was performed. Subsequently, this region was tattoed.

One year afterwards, vision with corrective lenses was 0.4. A decided improvement having taken place in the patient's general health, the left eye was prepared for operation. The only modification was that the apex was not abscised, but instead a small wedge-shaped piece of cornea was excised horizontally, and a similar piece at right angles to it vertically. The anterior chamber was not opened. The eye resented the traumatism inflicted by the operation and for several months remained irritable, and it was necessary to defer tattooing until fourteen months after the operation.

The final outcome in this case was satisfactory. The patient was examined recently, almost fourteen years after the first operation, and vision was found with corrective lenses to be 0.6 in the right eye, which had always been the more defective one, and 0.4 in the left eye.

She has been able during the last years to read and use her eyes with comfort and with not too much fatigue.

CASE II. Miss B., Evansville, Ind. General health good. Small iridectomy first performed in both eyes, followed in six weeks by tatooage without excision in the right eye. Several months later, the prominent apex of the cornea of the left eye was cauterized with the actual cautery. Both eyes remained irritable for months. Vision before the operation was less than 0.1 in either eye. Two years afterwards, the sight was found to be about the same, but the left eye was still irritable. Tatooage was indefinitely postponed and patient refused further interference.

CASE III. Miss W., æt. 20, Wyoming. High myopia and small central pellucid staphyloma in left eye. V. = 0.2, with corrective lenses. Progressive and prominent kerato-conus in right eye, associated with high myopia. Fingers could only be counted at four feet with this eye, but by holding a book at close range, almost in contact with the face, large type could be read.

A small iridectomy was first performed. This was followed by the production of cataract: subsequent discisions effected complete absorption of the lens. After this, from the central region of the cornea, a series of linear intersecting pieces of tissue were excised and their scars subsequently tatooed. The reward of this case was V. = 0.1, with the aid of corrective lenses and stenopaic devices.

CASE IV. A. B., Cincinnati, O., æt. 15. Double kerato-conus, V. = 0.1 D. — not aided by lenses, but considerable improved by stenopaic appliances. The deformity was most marked in this case, and unmistakable progression was taking place. General health excellent.

Double iridectomy (small), followed by application of the galvano-cautery in the right eye. This was followed by an irritable scar and much suffering, which extended over many months and resulted afterwards in a marked diminution of vision in this (right) eye.

CASE V. In contrast with the favorable outcome in the first and third cases and the negative returns for the second and fourth ones, I mention briefly my last experience with the surgical treatment of kerato-conus.

Miss S., Bellefontaine, O., consulted me first about four years ago. She had never enjoyed perfect vision either for distance or at close range. I found what others had discovered before me, a well-marked conical deformity of the cornea, occupying the central and adjacent regions in both eyes. In her most defective eye (right eye), V. = 0.1. Formerly, strong cylindrical combinations improved the sight slightly, but at this time only stenopaic appliances proved of benefit. The vision of the left eye was 0.3. She could with this eye read ordinary print, but every prolonged effort was attended with annoyance. In every other respect both eyes were found normal.

The rapid decline of vision in both eyes, the imperfect aid from lenses in her best eye, and the practically hopeless state of the right one, led me to suggest an attempt to improve this hopelessly defective eye.

The operation proposed consisted of the placing of a series of

linear intersecting excisions of tissue through the prominent central area of the cornea, to be followed later by a small iridectomy and tatooage of the corneal scars. In order to test the susceptibility of the cornea to traumatism, I determined, as an exploratory venture, to excise a single strip of tissue, just above the center, which appeared the most prominent, parallel to the horizontal diameter of the cone. The anterior chamber was then opened through the wound made. For forty-eight hours the eye remained bandaged and only the outer dressing removed, and there was no complaint whatever. After this, there was precipitated with incredible rapidity, on the third day, an intense reaction which foreshadowed the hopeless ruin of the eye. Complete sphacelation of the cornea, followed by panophthalmitis and orbital abscess, resulted. She opposed enucleation at first, but finally consented, and the eye, filled and surrounded with pus, was removed, only to be followed by cicatrical contraction in the cavity of the orbit. This was certainly an unhappy termination and depressing disappointment.

Every possible precaution had been exercised. The operation was performed with the least possible traumatism, amidst the most favorable surroundings and the most stringent asepsis. Cocaine was instilled but once. The patient was in excellent health; in fact, everything appeared as favorable as could be wished or desired.

One is almost forced to the conclusion that the greater dangers which attend surgical interference in this region are assignable to the extreme vulnerability of the central areas of the cornea to traumatism of every kind and degree.

In a deformed or conical cornea, with its nutrition precarious in consequence of the distortion, and possibly, also, the greater thinness of its tissues, these dangers appear to be increased. Although serious complications need not be looked for in every case, one must be prepared to find in certain instances that the simplest surgical procedure is violently resented, and this altogether out of proportion to the injury which is inflicted.

A further conclusion which suggests itself is that surgical

intervention should not be resorted to in one eye which is hopelessly defective if the fellow eye still retains V. = 0.3 or 0.2, even, if it can be established that the deformity in this, the best eye, is slowly progressive. Spontaneous arrest is possible at any stage of progression, and such an arrest with a fraction of useful vision is infinitely preferable to the risks, tediousness, and loss of time which must necessarily be incurred if surgery is resorted to for the more defective eye. My own very limited experience with these cases would prompt the suggestion to defer surgical treatment until vision is reduced to less than 0.1 in both eyes, and lenses and stenopaic devices are discarded as useless, and the patient is rendered helpless in consequence of the resulting loss of sight.

DISCUSSION.

DR. W. F. MITTENDORF. — It is a peculiar fact that very high degrees of myopia in children, after removal of the lens, require fairly strong convex glasses in order to make them see. That would, according to my mind, show that the myopia was not exactly due to axial distension of the eye, but to the condition of the lens. I have had two cases of this kind under observation, one of which was seen with me by Dr. Roosa, and the other by Dr. Derby. Cataractous changes developed in the eye and necessitated an operation, and in both, one a child of six and the other a boy of twelve, the myopia, which had amounted to 12 Ds. and 14 Ds., was overcome, and they now required a convex lens of 7 Ds. and 8 Ds. in order to see well, showing that the antero-posterior axis was not so much at fault as was the refractive media.

Often, in these cases of conical cornea, the use of a pressure bandage after the operation for the removal of the lens, or after a simple paracentesis of the cornea, may help to relieve the conical shape of the cornea.

DR. C. J. KIPP. — I would like to ask Dr. Sattler if his experience with other operations for high degrees of myopia is the same as in this case?

DR. SATTLER. — My limited experience with other cases was not very satisfactory. I have only given the history of this case, but mention in the full report the same view as that expressed by Dr. Mittendorf. I believe that the case was one of congenital malformation of the lenses, with preservation of their perfect

transparency, but with changes in the indices of refraction of different parts or sections.

This explains the apparent excessive myopia and the high degree of amblyopia, neither found to exist after the operations were performed, but, on the contrary, her vision was surprisingly good, the myopia moderate, and the amblyopia not at all marked. I have had other cases of excessive myopia, for which operation was undertaken, but in these marked changes at the posterior pole of the eye were present.

DR. H. KNAPP. — I would like to say a word about keratoconus, for I differ with Dr. Sattler in his opinion that when one eye is tolerably good we should not interfere. It is just in those cases that I operate. I do not think it is correct, either, that the protrusion is central, for, so far as my experience goes, it is in the majority of cases somewhat below the center. I have not been unlucky in regard to the results of the operation. For a number of years I have stuck to one method, the galvano-cautery, and the results have been satisfactory.

The greatest protrusion is here (illustrating). The principle upon which the operation acts consists in the secondary contraction of a cicatrix, and if we fail to produce that we fail in the operation. It may be done by cauterization with silver nitrate, or the galvanic cautery, etc. If I used the latter superficially so that there was no perforation, the wound healed and the conus was not very much reduced, so that I have lately resorted always to perforation, and in a number of cases do that with the disk-shaped electrode. Holding it a little sidewise, I get a small opening, but in other cases I have pressed it on the cone, turned on the current that produced the scar, and if there was no perforation I made one with a pointed electrode. I have not seen a case of inflammation following it, but it takes six weeks or more for the ulcer of the cornea to cicatrize. I keep the patients in the hospital and watch them very carefully. If the cicatrization takes place in four or six weeks with closure of the fistula, glaucoma is apt to follow, but it is usually combatted with eserine, as are the milder attacks of glaucoma, and if that is not sufficient, a paracentesis or an iridectomy will cut the glaucoma short. In only two cases have I been obliged to make an iridectomy.

DR. THEOBALD. — What happens to the iris in these cases? Do you have anterior synechia?

DR. KNAPP. — Yes. In about one case in four, but in those cases iridectomy is not usually necessary, for often the iris frees itself afterwards.

DR. T. Y. SUTPHEN. — I have within the last few years operated upon two cases of conical cornea in the same family with the galvano-cautery. One, Dr. Knapp saw with me, and advised this course. The result was a slight scar without perforation and apparent arrest of the trouble.

DR. KNAPP. — I think it is essential not to use the electrode at white heat, and this also applies in using the ordinary galvano-cautery in ulcers, etc., for it causes scarring and destruction to a greater distance than we desire. In one case where I cauterized twice, the lens was affected and I had to operate later for cataract.

DR. H. D. NOYES — It is an experience that has been confirmed by many, that cases of conical cornea are often improved in vision by the employment of convex cylinders.

DR. EMIL GRUENING. — The discussion being on the removal of the lens in high myopia, etc., and Dr. Sattler having said that his experience was " negative " in some cases, I would like to hear Dr. Sattler explain what he means by that. Did he lose the eye, was there detachment, was the lens not absorbed, or what was the outcome of his operations?

DR. SATTLER. — The patients selected were all under twenty, and the surgery resorted to was not attended by unfavorable sequences, but the final results were not as satisfactory; that is, they were not benefited as much as was hoped for. They simply did not come up to the expectations, either with or without the use of lenses after the results of the operation were fully disclosed, when compared with the acuity of vision which existed before with the old lenses.

DR. C. J. KIPP. — Only good results have been reported here from kerato-conus operations. I saw a case, some time ago, however, in which the operation done by a good operator was followed by panophthalmitis six weeks after the operation. The eye was apparently doing well for six weeks, when suddenly purulent irido choroiditis developed, and the end was destruction of the eye.

DR. C. S. BULL. — On the operations in high myopia it seems to me we need a great deal more information to determine the cases that are operable. I have kept a record of 347 cases of very high myopia, that is, more than 12 Ds., and in only three was the condition of the eye such that it seemed to make such an operation advisable or desirable. In only three was the fundus in such a condition as to make it at least wise to operate, and in all three

the operation was declined when a statement of the dangers was presented to the patient. In the one case in which I have operated, a young person of eighteen, with a myopia of 18 Ds., and a fairly healthy fundus, the result was extremely unsatisfactory. The swelling of the lens was very rapid, with intense injection, so that extraction of the lens had to be done within forty-eight hours after the needling, and the result was but little improvement in vision, due to the opacity of the capsule which followed, and the condition of the eye was such that I was afraid to operate upon the capsule.

DR. D. B. ST. JOHN ROOSA. — What has been said by Dr. Bull agrees exactly with my own feelings on the subject. I had the opportunity in Paris to learn exactly of these operations, and I became impressed there with the belief that we need just what Dr. Bull has said, information, and exact information, as to the methods of operating and the results. I hope that Dr. Sattler will be good enough to report to this society a detailed account of each case in which the results were negative. Under the best of circumstances, the progress of the operation must be in the very nature of things tedious. The men who have had the most to do with it say that when you start out to remove the lens for high degrees of myopia, you begin a long walk and must be satisfied if within two months you have come to the end and bettered the condition of the patient. We want to know what the conditions in the background of the eye were in unsuccessful cases, and indeed we want in this comparatively new subject as much light as we can possibly get, that the few cases that come to a man in which he would operate may be treated with as much success as properly belongs to the operation.

DR. S. D. RISLEY. — I think the subject of operation for myopia is one about which this society should freely speak its mind. Without wishing to prolong the discussion, I desire to place myself on record as being fully in accord with the views expressed by Dr. Bull and Dr. Roosa. After considerable experience in the management of high myopic eyes, I have not yet seen the case in which I felt like venturing upon the removal of the transparent lens. There are always pathological eyes, and I not only agree with Dr. Roosa that " it is a long walk we are taking " in attempting extraction, but wish to insist that it is one beset with many dangers.

The " unsatisfactory or negative results " which Dr. Sattler has reached I think are to be anticipated in operating upon an

organ that is already diseased. In the few instances in which I have undertaken to get rid of the cataractous lens in highly myopic eyes, my experience has sustained such anticipation. In extracting even the opaque lens from myopic eyes, we soon learn that the danger of a bad result is much greater than in other eyes, and that they should always be included in the group of complicated cataracts.

As to the conicity of the cornea, my observation has shown that in many instances the progress of the corneal distension has not been on the lines of a cone, but presents a wave-like stretching of the cornea, the axis being approximately horizontal.

Before undertaking operation in these cases, unless there is opacity at the pole of the cornea, we should make persistent and patient efforts for improvement by the use of drugs, prolonged mydriasis, or eserine in some cases, and the application for a long time of a protective bandage with the subsequent earnest endeavor to correct them by the use of cylinders. In a large group of instances which had been discouraging at first, I have been able to improve the vision greatly by very high cylinders. The cylinder glasses in our ordinary test sets are often not sufficient, *e.g.*, I have one gentleman wearing a glass composed of crossed cylinders over one eye the formula for which is —11 D. axis 10°, + 10 D. axis 100°. With this glass he has a vision of 20/40 when the glass is fixed properly before his eye. In the first study of his case I gave him a discouraging opinion, but later, with the use of the stenopaic slit, I found good vision with a suitable glass before the slit. Patient effort resulted in ordering the glass mentioned, which he has been using for twelve years or more. Before resorting to operative interference, I am sure we should always try to correct these cases with cylinder glasses.

Dr. Noyes. — Have you made any use of the hyperboloid lenses? I tried them for some time in the effort to improve the vision, but had to lay them aside.

Dr. Risley. — Dr. Noyes's experience agrees with my own in the use of hyperboloid lenses.

Dr. Noyes. — Sometimes convex lenses will do the thing when cylinders will not.

Dr. Wm. Thomson. — It seems to be going back to things prehistoric to say that I called attention to this over twenty years ago, and the paper can be found in our proceedings. I have quite a number of people who have passed a lifetime of comfort by

the use of these very high cylinders. Just before leaving home I had a letter from a grateful lady in Wyoming, a schoolteacher, who has used them for many years. Dr. Knapp says the apex of the cone is never in the center, and when you approach a case of that kind you have to do so purely empirically, but by simple perseverance I have been able to get an acuity of vision of 20/40 or 20/30, which has enabled them to go on for many years without any further treatment. In many cases you produce a monocular diplopia, so that when your patient looks at a small point of light, by putting the head in a certain position, he sees the light distinctly without any astigmatic effect, and either below or above it a large pear-shaped image of the light, which can at pleasure be thrown aside, so as not to impair the view of the light proper. To make the best use of the pupillary area is the object to be attained.

Dr. Samuel Theobald. — I would like to ask Dr. Risley if the astigmatism in the case he referred to was equal to the sum of the cylinders?

Dr. Risley. — Yes. It was about 21 D.

Dr. W. H. Wilmer. — I would like to ask about the effect upon the progression of the disease where these high cylinders are used. I have a number of patients wearing them, but the disease is still progressing.

Dr. Risley. — In the case I have detailed there has been no progression, but on one occasion I found it necessary to make a slight change in the direction of the axes of the cylinder.

I would like to emphasize as first in importance the treatment of these cases by mydriatics, eserine, and bandaging. Dr. Sattler has said that they are usually progressive, which is in accord with my own observation in cases where no treatment has been instituted. I think they should be treated as pathological eyes. It has therefore been my habit to treat them by mydriatics for weeks at a time, allowing them to wear smoked glasses, and using a firmly applied bandage over one or both eyes. I apply it for a few days over one and then over the other. All attempt to use the eyes is forbidden, and careful attention given to the general regimen. When the eyes seem to have reached a satisfactory condition for the prescribing of glasses, I then patiently work out the problem of corneal refraction, first doing it with a dilated, and later through the normal pupil. I have in my set of test glasses an opaque disk with a central opening, 3 mm. in diameter. By fixing the patient's head firmly in the optometer in the desired position, this disk is placed before the most favorable part of the

cornea, when it acts as a diaphragm or artificial pupil, shutting out temporarily the more distorted area. Having reached the best correction possible, the mydriasis is allowed to disappear, the work carefully reviewed, and the glass ordered. Care must be taken to have it so mounted by the optician that the optical center of the glass shall rest before the selected portion of the cornea. The examination is very tedious and requires careful work and great patience on the part of both doctor and patient.

DR. HARLAN. — Does the prolonged use of mydriatics have any effect upon the increase of tension?

DR. RISLEY. — I have never witnessed any increase of tension, but, nevertheless, in some instances weak solutions of eserine have afforded better results than atropia, but usually the latter is to be preferred. It speedily secures the comfort of the patient and does the eye good.

DR. L. H. TAYLOR. — Do you have any difficulty in getting the patients to wear such glasses?

DR. RISLEY. — On the contrary, they are greatly pleased with them, if one is able to accurately correct a given portion of the cornea. The correct mounting of the glass is an important factor. The glasses are so strong that a millimeter or two of displacement of the optical center makes it difficult to wear them.

DR. G. E. DESCHWEINITZ. — About ten years ago, following the methods recorded by Dr. Thomson in the paper to which he has referred, a few cases of conical cornea seen in the dispensary of the hospital of the University of Pennsylvania were fitted with high cylindrical combinations. Dr. James Wallace published these and other cases in the University Magazine, and recorded strikingly favorable results. At his suggestion, very high cylinders were added to the ordinary trial cases to be used for this purpose.

Like many of my colleagues, I have often employed very high sphero-cylindrical combinations to improve the vision of patients with conical cornea. I agree with Dr. Wilmer that in young people these glasses do not always check the progress of the conicity. However, ordinary compound hypermetropic astigmatism may be progressive and changes in refraction must be met by suitable changes in the lenses. I have been particularly impressed with the visual results in a number of patients of mature years with conical cornea attained with high cylinders —

patients who had despaired of obtaining relief from optical therapeutics. In one recent patient, 59 years of age, with a — 15c. axis 100, V. = 6/20; without the glass, V. = counting fingers and reading print only when it was held almost against the nose. Operation had been advised as the only feasible plan of treatment before I tried the cylinder. Dr. Risley speaks of using mydriatics. I always employ them as part of the routine examination, but the final glass must be determined by a post-mydriatic examination. Indeed, for a week or more before ordering the glass I prescribe a collyrium of pilocarpine (gr. $\frac{1}{8}$ — ʒ i) and continue its use afterwards.

Dr. Myles Standish. — I only rise on account of some remarks about hyperboloid lenses. My experience has been different from those given. I have ordered quite a number, and many of them are in use now, having proved very satisfactory to the wearers. One of my patients, who is a cataloguer in the Boston Library, has worn them for many years. I should not like to have them thrown into limbo with the general remark that they are of no use.

Dr. Sattler. — I certainly agree with Dr. Knapp that the malformation is not in the mathematical center of the cornea, but involves the adjacent regions as well.

So far as my experience with cauterization is concerned — this applies to the actual and galvano-cautery and caustic remedies like nitrate of silver — I have found that it is more painful and tedious, and more likely to be followed by necrotic changes which later keep the eye irritable for months. I wish to say once more that surgical treatment of the cases mentioned was resorted to only after vision was reduced to less than 0.1, and after every other method had been exhausted.

Dr. O. F. Wadsworth. — I would like to say a word in regard to progression. My experience agrees with that of the other gentlemen, that the progression occurs in young people and is not likely to occur later in life, but I have seen one case which I remember especially, where the conical cornea came on as late as thirty years of age, the eye having been perfectly good beforehand. The conical cornea developed in the course of some two years and then remained stationary.

THE TREATMENT OF ENTROPION OF THE LOWER LID WITH CAUSTIC POTASH.

BY SAMUEL THEOBALD, M.D.,
BALTIMORE, MD.

Although, in the just-issued third volume of Norris and Oliver's "System," I find, in Dr. Harlan's chapter upon "Diseases of the Eyelids," this statement, "The formation of cicatrices by actual or potential cautery [for the cure of entropion] was formerly practiced, at first by the Egyptians, but may be considered obsolete," I still have the hardihood to bring before the society the subject described in the title of this paper and to speak rather enthusiastically of the favorable results which, in suitable cases, this method of treatment yields.

At the outset it may be stated that the cases to which it is preëminently adapted are those of senile entropion, from relaxation of the lid tissues, but that it also yields good results in those which are consequent upon trachoma and are attended by an incurving of the tarsal cartilage.

To those who have had no experience in this method of dealing with entropion of the lower lid the questions would naturally suggest themselves: Why use a caustic rather than the knife to accomplish the end in view? and, if a caustic agent is to be employed, why select potash rather than the galvano — or thermo — cautery? My answer would be that it is not an easy matter to determine just how much tissue to remove with the knife, and that from an experience with both methods I have found the desired effect can be obtained more exactly with the caustic than with the knife. It would seem, moreover, that the destruction of a given amount of tissue by the potash produces a somewhat greater mechanical effect than the removal of the same amount with the knife. As to the choice of a caustic agent, the potash, though painful, can be readily used with the aid of a local anæsthetic, whereas the application of the actual cautery in such close

proximity to the eye is impracticable without the induction of general anæsthesia.

There is not, so far as I am aware, anything novel in the manner in which I have employed the potash; but to those who may wish to try this plan of treatment a few suggestions as to details may be useful.

In the first place, the crayon of caustic potash must not have too blunt an extremity, otherwise it will be difficult to apply it with the requisite degree of exactness. The sharpening is easily accomplished by rubbing the end of the crayon upon moistened blotting-paper, whereas to sharpen it with a knife is exceedingly difficult.

Soaking the lids for ten or fifteen minutes with a strong solution of cocaine appreciably lessens, though it does not annul, the considerable pain which the action of the caustic produces.

In applying the caustic our aim should be to produce an eschar 3 to 4 mm. in width, parallel with the lid margin and extending the whole length of the tarsus. At no point should the action of the caustic be allowed to approach nearer the margin of the lid than 1½ to 2 mm., and as the destruction of tissue tends to spread considerably beyond the actual point of contact of the crayon, the line of application of the latter should be about 4 mm. from the ciliary border. Along this line, the lid meantime being everted and kept well upon the stretch, the crayon should be drawn back and forth several times, until the epidermis is destroyed and the tissues beneath begin to assume a brownish color. Holding the lid carefully so that it shall not become inverted, the action of the caustic is allowed to extend as far as may seem desirable, when it should be arrested quickly by the application of an acid solution. Vinegar diluted with an equal quantity of water answers well for this purpose, or acetic acid diluted with water to about the same strength may be used, if more convenient.

Within a few minutes the eschar begins to contract, and when the lid is released it is usually found that the tendency to entropion has been already overcome. A simple dressing may be applied

if thought desirable; but it seems to be a work of supererogation, as the cases always do well without this precaution.

It is seldom necessary to repeat the application of the caustic, but this can be readily done if the effect of the first application has proved insufficient. Although at first there is considerable soreness and tumefaction of the lid, this soon disappears, and after a few weeks all traces of the eschar have faded away, and it is usually not possible to detect that any operation has been performed.

A number of cases, especially cases of senile entropion, operated upon successfully in this manner might be related, but this would occupy unnecessarily the time of the society. I may mention, however, that my associate, Dr. Reik, has recently operated in this way with complete success upon a case of entropion of the lower lids due to trachoma, in which Green's operation was required upon the upper lids, and that a few weeks since I operated upon a similar case with equal success, although in this instance a second application of the caustic was necessary.

In conclusion, I may emphasize the point that this method of operating is suited only to entropion of the *lower* lid. In entropion of the upper lid the tarsal cartilage, which is thicker and broader than in the lower lid, usually plays a more important part in the production of the deformity, and not much can be expected from any procedure which involves little else than the removal of a portion of the external integument.

DISCUSSION.

DR. H. KNAPP. — I am thankful to Dr. Theobald for this paper, for it is just this form of entropion that has vexed me considerably. I have employed a number of operations, none with constant permanent success. I saw the actual cautery used in Italy, but could not watch the results.

DR. F. W. ABBOT. — May I ask Dr. Theobald why he prefers soaking the lids with a solution of cocaine to using it hypodermically?

DR. THEOBALD. — I do not especially prefer it. I have simply done so because the operation is tolerated when the soaking is

done, and as the hypodermic injection is itself somewhat painful, I have not thought it necessary to use it; but should I have a very nervous patient I might perhaps inject the cocaine hypodermically.

In Dr. Reik's case, and in some of my own cases in which a favorable result was obtained, other operations had been previously done for the correction of the entropion without success.

DR. EMIL GRUENING. — I am very much interested in this class of cases, for in former years senile entropion puzzled me also. My operations of late years, however, are permanently successful and without the use of caustic or the removal of tissue.

I make an incision four or five millimeters from the free edge all along the edge of the lid. Then I dissect off the skin below so that the skin itself appears as a flap, and I dissect the skin also to the infraorbital edge so that the skin flap is presented in this way (illustrating on the board). I then introduce my suture through the lower flap, the tarso-orbital fascia, and the upper flap. I use three such sutures. Sometimes it appears as if the effect of the operation was exaggerated, but that doesn't matter, as even if the lid lis turned out and remains in a condition of ectropion, immediately after the operation it soon takes a good position. I have certainly performed the operation thirty times with good permanent results. It is essentially the Hotz operation.

DR. H. D. NOYES. — I have relied upon a method of operating almost the same, except that I remove a narrow strip of skin and carry deep sutures into the oculo-orbital tissue, grazing the edge of the orbit so that I have a deep anchorage. The results have been good.

DR. F. M. WILSON. — Does Dr Gruening carry the suture into the orbital tissue?

DR. GRUENING. — I strike the floor of the orbit with my needle and then turn and come back.

DR. POOLEY. — How far does that differ from the operation of Dr. Hotz of Chicago?

DR. GRUENING. — It is essentially the same thing.

DR. JOHN GREEN. — In spastic entropion of the lower lid I have found the following simple operation to give, in many instances, an exceedingly good result. I do not believe in attempting to make much traction upon the integument of the lid. The

operation consists in the excision of a narrow strip of skin, together with the underlying fascia and muscle, parallel to the line of implantation of the cilia. The removal of this strip is best accomplished by first isolating it by making two deep parallel incisions, the first about 1 mm. from the row of eyelashes, and the second 2½ mm. to 3 mm. from the first, then grasping it with toothed forceps and cutting it away with scissors. This is, in most cases, immediately followed by the spontaneous restoration of the lid margin to a normal position; no sutures, and practically no dressings, are required. The amount of skin sacrificed is very small, the healing is rapid, and the linear cicatrix is practically invisible.

Dr. S. D. Risley. — I wish to call the attention of the society to a simple procedure I have occasionally adopted for the relief of annoying senile entropion. While it may not be entirely germane to the subject of the paper, it may be of interest. The inward rolling of the lower lid seems to be due to a relaxation of the tissue over the inferior border of the cartilage. The lid can be made to roll outward temporarily by simply shortening these in the grasp of the forceps or by making traction upon them toward the temple. I have sought to produce this effect permanently by the following procedure. (Illustrated on blackboard.) An incision is made directly outward from the external canthus as in canthoplasty. The lower border of the incised structures is then seized with forceps, and a triangular piece of tissue removed, the base of the triangle being the primary incision, the apex pointing directly downward. A deeply placed suture then draws this apex upward and outward, fixing it at the outer end of the primary incision. The effect is to make tension in the direction of a line parallel to the inferior border of the cartilage without distorting the ciliary border of the lid, which at once rolls outward, correcting the entropion.

Dr. Gruening. — Dr. Hotz did not recommend this operation for senile entropion, so far as I know, but the operation is essentially his and may be utilized for this purpose.

LYMPHOMA OF THE LIDS.

By MYLES STANDISH, M.D.,

BOSTON, MASS.

For thirty years there have been cases reported from time to time in ophthalmological literature of a new growth in the orbit or lids, which consisted, pathologically, of a pure round cell structure; clinically, was marked by rapid growth, and very often accompanied by similar new growths in the nose or pharynx. Such cases have been considered to be lymphomata or a lymphosarcomata by different writers, but from the descriptions have undoubtedly been the same condition. That it is not a common affection is evidenced by the fact that the total number of cases reported is quite small.

It so happens that I have seen two cases within a year which belong to this group, and I think it of interest to report them here, more especially as one of them, which returned after repeated operations, was finally cured by the internal administration of arsenic.

The first case was a gentleman sixty-six years of age, who came on the 20th of October, 1896, complaining of an increasing difficulty in opening his right eye. In fact, he could not at the time I first saw him lift the upper lid above upper edge of the cornea. He said the difficulty had been more or less present for a year, but of late had rapidly increased. Upon examination a new growth was found in the lid occupying the situation of the so-called tarsal cartilage, and was about three-quarters of an inch in length and half an inch broad. The skin moved freely over the growth; upon everting the lid, which was done with great difficulty, shaggy villous-like projections were found on the conjunctival surface, of a pale violet color and bearing a certain resemblance to irregular trachomatous nodules. When these masses were touched with a probe, it readily penetrated the

mass and went through what appeared to be a firm tissue into the soft structure of the tumor. The gentleman reported that three months before Dr. A. S. Cabot had removed a tonsil which had become greatly enlarged. As I was in some doubt as to the nature of the pathological condition present, I removed one of the nodules from the conjunctival surface and sent it to Dr. E. Wyllys Taylor for a pathological examination, and wrote Dr. Cabot asking for information as to the condition found in the tonsil. Dr. Cabot replied that the microscopical examination showed that the growth was made up of small lymphoid cells, and was regarded by Dr. W. F. Whitney as a lympho-sarcoma. Dr. Taylor, to whom the nodule from the conjunctiva was submitted, reported that "one edge of the specimen submitted is normal conjunctiva, which becomes rather suddenly pathological, a tissue of new formation evidently taking place of the conjunctiva and destroying it. The new-formed tissue is made up chiefly of round (lymphoid) cells in great numbers. The cells are arranged in no definite way as regards their relation to a connective tissue stroma, and the growth is therefore not to be regarded as a tumor in the ordinary sense in which that word is used. There are no leucocytes in this new-formed tissue; it does not therefore represent an acute inflammatory process." Upon the receipt of these reports I operated upon the lid under cocaine anæsthesia through an incision in the upper lid. The growth was found to be a soft friable structure, as far as I could determine macroscopically, not encapsulated, and of a gray-violet color. On account of its softness and great friability, it was removed with considerable difficulty. There was considerable hemorrhage. The wound healed kindly. The entire tumor was removed and has not returned.

The second case was a woman sixty-three years of age, who came on the 2d of April, 1897, reporting that there had been a swelling at the site of each tear sac, slowly increasing in size for five or six years; that for the past year hard swellings had been coming in each lower lid, and also of late in the upper lid of the right eye, until now she could not open the right eye to its

usual width. Upon palpation, the swellings at the sites of the tear sacs were very firm and had the feel of bony structure. The tumors in the lids were of firm consistency and occupied the whole of the lower lids; they were rounded on their anterior surfaces, and projected markedly outward, as will be seen in the photograph taken at this time. The skin was freely movable over them. The growth in the upper lid was flatter and about half an inch long and approximating a quarter of an inch in width. The base of these tumors as seen through the conjunctiva, which was perfectly smooth and glistening, were of violet color.

On the 17th of April, I operated on the growth in the lower lid of the right eye under cocaine anæsthesia. The growth proved to be larger than I had anticipated, and to extend farther back over the edge of the orbit than I had been led to expect by the external examination. It consisted of the same soft gelatinous friable material that I had found in the previous case, and was so intimately attached to the conjunctiva that to remove it without taking away the conjunctiva also was very difficult. The wound healed quickly, and it was then discovered that a small portion of the growth about the size of a split pea remained at one end of the incision. On June 25th, I operated on the lower lid of the left eye. The conditions and difficulties were the same as in the other operation, and in order to get all of the tumor an incision of considerable length was necessary. This was closed with five sutures. The wound healed quickly, and the patient was discharged from the hospital on July 2d. Microscopically, the structure was found to be of uniform character, made up of great numbers of round cells deposited in a fine connective tissue meshwork, and was considered a simple lymphoma, although some gentlemen who saw the slides were inclined to call it a lympho-sarcoma.

The patient was next seen by me on the 1st of September, 1897. Then the small bit of new growth left in the lower lid of the right eye at the first operation had greatly increased in size. The tumor in the upper lid had also markedly increased, and was an inch in length, over half an inch in width, and so thick that the

growth mechanically prevented the raising of the lid, and the patient was obliged to tip the head backward in order to see with that eye. The growth had also appeared in the upper lid of the left eye.

I sent the patient to Dr. J. L. Goodale for an examination of the nose and pharynx, and he reported as follows:

"Examination nose and throat October 9, 1897. Nose: left turbinates not remarkable except for slight hypertrophy. Right low turbinate markedly hypertrophic with cicatrix anteriorly and adhesion to septum in middle portion, causing nearly complete occlusion.

"No evidence of new growth from anterior inspection.

"Posteriorly: pharyngeal vault bears several rounded, sharply elevated, closely aggregated growths from the size of a millet seed to that of a pea, with general aspect of adenoid tissue.

"Pharynx: behind the right posterior pillar is a rounded growth the size of a pea, firm, with smooth pinkish surface, suggesting a greatly enlarged follicle. Right tonsil bilobed; left, single lobe; both larger than normal in view of patient's age. Crypts not dilated.

"On the lingual tonsil are conspicuous sharply elevated masses from the size of a millet-seed to that of a pea.

"Larynx normal."

On October 29th, I operated upon the upper lid of the right eye and found the same structure and experienced the same difficulties in the operation that I had encountered in operating on the two lower lids.

Upon healing, the growth quickly reappeared in several nodules, and I again operated to remove them on November 23d.

Again, on December 7th, I operated to remove the growth in the lower lid of the right eye. But all these operations were of no permanent avail, as by the last of December the growth had returned in the upper lid of the right eye, in the lower lid of the right eye, and was also rapidly increasing in the upper lid of the left eye. Moreover, the dense hard swellings over the site of each tear sac also began to increase. The condition in the

pharynx also became much worse and so obstructed the air passages that the patient could not sleep lying down, and it became necessary to bolster her up in bed to almost a sitting posture, in order that she might sleep without distress. Luckily, at this time Dr. W. D. Hall called my attention to an article by Bronner in the transactions of the seventh International Ophthalmological Congress at Edinburgh, in which he had reported a case of lymphoma of the eyelids as cured by the internal administration of arsenic. I immediately ordered five drops of liquor potassæ arsenitis to be given three times a day, to be increased a drop every other day until a maximum of ten drops three times a day was attained, and to be continued at that dose, which was done with intervals of omitting the drug when such action appeared necessary. The tumor continued to increase for a month after the Fowler's solution was given, but at the end of thirty days a note was made that the tumors were diminishing in size, and twenty days later the diminution was noted as nearly one-half, and also that the patient could open her eyes moderately well. From this time on the recovery was uninterrupted. The growths in the lids absolutely disappeared.

The bone-like tuberosities over the tear sacs softened and finally disappeared. The trouble in the pharynx cleaned up in the same remarkable manner, and patient could sleep lying down. When last seen by me, about the 1st of July, she had taken *no* arsenic for nearly three months, and there was not the slightest trace of any return of the disease, as the accompanying photograph will show.

I regret that I have no photograph of the case as it appeared when the administration of the arsenic was begun.

DISCUSSION.

DR. E. E. JACK. — I would like to make inquiry about the swelling over the tear sac. I remember the case very well, but do not recollect whether the sacs were involved in the growth.

DR. STANDISH. — While there was some discharge from the sac, and since the swelling has disappeared there has been further discharge, I do not think the swelling was due to the contents of

FIG. 1.

FIG. 2

the sac, because it could be emptied without diminishing the apparent size of the swelling.

DR. DESCHWEINITZ. — It is well known that lymphomas, especially when situated in the orbit and appendages of the eye, will disappear under the influence of arsenic; and Dr. Standish's case is a striking example of the value of this therapeutic agent under these circumstances. I have twice seen nodules of apparently malignant composition disappear, or at least materially diminish in size — under the influence of large doses of Donovan's solution in one instance (a case of multiple sarcoma of the skin under the care of Dr. Pepper in Philadelphia), and by the administration of a proprietary preparation which contains arsenic and mercury in the other instance (case of lymphatic enlargement in association with carcinoma of the breast). I confess these cases are too vague to be of much value, except in so far as they direct our attention to the advice of Panas and others, that in certain morbid growths, notably lymphomas, arsenic should be tried.

A CASE OF SPINDLE-CELL SARCOMA INVOLVING THE CONJUNCTIVA AND CORNEA — REMOVAL OF GROWTH WITHOUT IMPAIRMENT OF SIGHT.

With photograph and microphotograph.

BY S. B. ST. JOHN, M.D.,

HARTFORD, CONNECTICUT.

I simply desire to place upon record a case that is very rare in its nature and about which we do not know as much as we wish we did. These malignant tumors of the eyeball are certainly of considerable rarity. Dr. Noyes went over the field very exhaustively twenty years ago, and published 127 cases, of which only four were of the variety of which I propose to offer an instance to-day. He found sarcoma the least frequent of the tumors of the conjunctiva, and his conclusions were that in some cases these malignant diseases of the conjunctiva and cornea were purely local. The last book on ophthalmology, Norris and Oliver's System, in the volume just published touches upon the subject, but adds nothing new to it, except the report of Kraus.

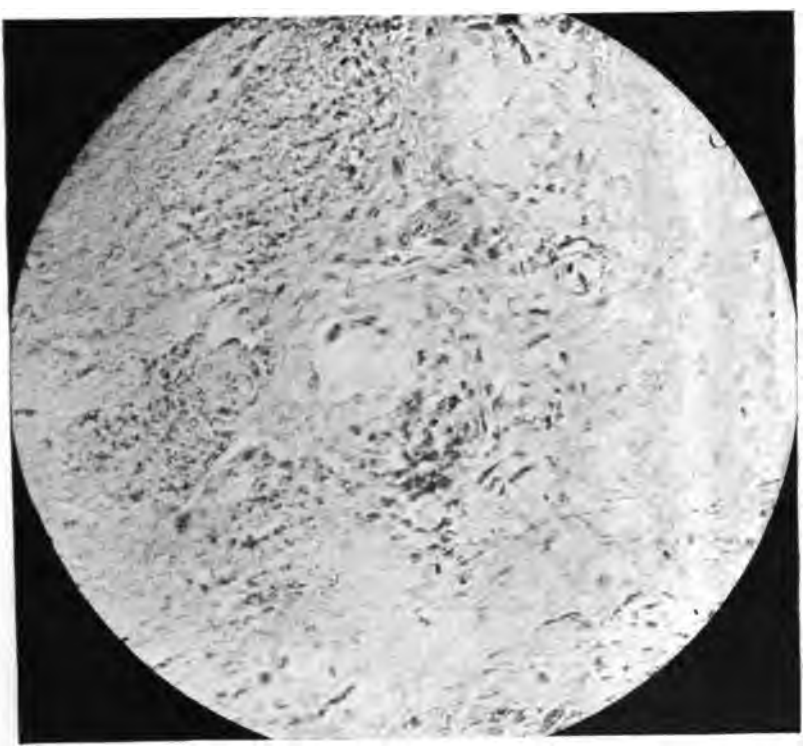
Dr. deSchweinitz, in his text-book, says that sarcoma of the conjunctiva arises at the limbus and usually overlaps the cornea.

The case I show is a man seventy-two years of age, who came under my observation very recently, the 7th of May, 1898. He was a farmer and had been in pretty good health. The right eye had been lost twelve years ago through traumatism produced by a flying chip while he was engaged in chopping wood. The eye had never given any irritation. About the end of March he noticed a lump on the left eye about the size of a pin-head. It never gave any pain, but caused some little irritation. It grew so rapidly that it alarmed him, and when I saw him two and a half months later it was of the size of a large pea, of a pale pink color, with a shining surface. About one-half of it overlapped the cornea, and the part that sprang from the conjunctiva seemed to move with the conjunctiva. Its consistence was about that of the ordinary papilloma.

Removal was very simple, the part connected with the cornea being readily dissected off, leaving a surface similar to that left after the removal of a pterygium. After detaching the growth from the cornea, I simply excised a considerable portion of the conjunctiva and made a small plastic operation to cover the gap.

I want to call attention also to the fact that we can make a pictorial record of these cases in a very simple way. I have a photograph which was taken in my office with an ordinary Kodak camera (Fig. 1), and from that was made a bromide enlargement (Fig. 2), which shows the situation and size of the tumor very nicely. I have also the microphotograph of the specimen, and will pass around the negative, which, in a good light, is perhaps more satisfactory.

The specimen was pronounced a spindle-cell sarcoma by an expert pathologist, Dr. A. J. Wolff of Hartford, to whom I am also indebted for the beautiful microphotograph which accompanies the paper.



Dr. St. John's case of Spindle-celled Sarcoma of corneo-scleral junction (micro-photograph by Dr. Wolff of Hartford).

A CASE OF INTERSTITIAL KERATITIS, CONGENITAL IN ORIGIN.

By HOWARD F. HANSELL, M.D.,
PHILADELPHIA, PENN.

The opportunity was afforded me, through the courtesy of Dr. E. P. Davis of Philadelphia, to see the following case, the interest of which lies in the rarity of the affection or of the published accounts of it, and the possible confusion of its early stages with the purulent ophthalmia of infants.

A. H., 36 hours old, is the third child of apparently healthy parents. There is a family history in the grandparents of phthisis and diabetes. From birth its lids were swollen, blue-red in color, but not markedly distended or tense; a thin, watery, yellow discharge, moderate in quantity and containing neither mucus nor pus, exuded through the palpebral fissure; the palpebral conjunctiva was smooth and without enlargement of its follicles or deposit in its stroma; the ocular portion of the membrane was greatly distended, from the fornix to the limbus of the cornea, by an almost transparent effusion, only slightly vascular and of the color of the sclera. The fornix was also chemotic and thrust forward into the fissure. Forcible separation of the lids and inspection of the cornea showed a gray infiltration of the deep layers, consisting of fine points that tended to become confluent, most dense over the pupil, without vascularity or loss of epithelium. The pupils could scarcely be seen, particularly the right, in which the corneal opacity was more dense. The iris was not inflamed. The chemotic conjunctiva could readily be mistaken, at first glance, for the white sclera, but close examination proved that the sclera was entirely hidden by the pallid and chemotic conjunctiva.

On the third day of the child's life the under surface of the upper lid was partly covered by a tough, yellow, smooth membrane closely clinging to and apparently forming a part of the conjunctiva. Detachment without pain or bleeding was impossible, and, as it seemed to be a part of the process of inflammation and was inflicting no damage upon the cornea, it was al-

lowed to remain. Having ordered atropin, boric acid and formal, 1/2000, I feared that the latter, because of the evidences of pain immediately following its use, was responsible for the development of the false membrane. Its discontinuance, however, had no effect upon its absorption or increase in size. It persisted, gradually growing smaller, until the subsidence of the swelling of the lids, when both it and the discharge disappeared.

The corneæ slowly became clear, until in six weeks the slightest trace only of the opacity remained in the right eye. A few small vessels, extending from the limbus through the cornea, formed toward the termination of the disease.

The local treatment was exceedingly simple, and consisted of antiseptics and mydriatics. No silver was applied at any time. The main reliance was upon the general remedies instituted by Dr. Davis.

The cause of this unusual congenital inflammation of the cornea will probably be found in the conditions existing before birth, primarily in the mother, secondarily in the child, upon which Dr. Davis's report throws considerable light. "The mother is a tall, pale woman, having a pelvis slightly larger than the average and symmetrical. During her second pregnancy she was comfortably well and her urine nearly normal. Her second labor was rapid, and a male child, weighing eight pounds, was quickly born. It was well-formed and healthy and is now living. The patient made an excellent recovery from labor, but soon ceased to nurse the child. The patient's third pregnancy occurred soon after the second, when she was busy with the care of her children and was not strong. During this pregnancy excretion was badly performed and she was never well nourished. The third child, whose case is described above, was born ten days before term. Like the second, delivery was precipitate. The membranes were peculiarly soft and were adherent to the cord and to the cervix. They were friable and difficult to remove. The mother had a very profuse mucous discharge, but had not reported such discharge during pregnancy. Although the child's eyes were promptly cleansed with boric

acid solution, and all antiseptic precautions taken by doctor and nurse, the child developed at once the condition seen by Dr. Hansell. The mother had no fever and recovered in the usual time.

The mucous membrane of the child's mouth and the mucous layer of the skin developed an eruption resembling purpura. Its bowels were frequently moved. It nursed eagerly and seemed fairly vigorous, although not as strong as the other children. Analysis of the mother's milk showed: fat, 1.31; sugar, 6.45; albumenoids, 1.50; mineral matter, .21; water, 9.55. It was deficient in fat to a considerable degree, very slightly in sugar. The child was given whisky in small doses, oil inunctions and irrigation of the bowels with warm water daily. The mother's blood contained hæmoglobin 58 per cent., red corpuscles 4,320,000, white corpuscles 8,000. The blood cells were very pale, but uniform and fairly large. The child's blood contained hæmoglobin 92 per cent., red corpuscles 7,280,000, white corpuscles 10,000. The blood cells were very poor in appearance and small. It should be noted that this is decidedly anemic blood for an infant. The child had recently had several attacks of diarrhoea and intestinal disturbance. The mother has suffered from profuse and frequent menstruation and a mucous discharge.

So far as the general conditions here are concerned, the mother's poor health during pregnancy would account for the ill-nourished child. The mother has never had specific disease nor septic infection.

In searching through recent literature, I have succeeded in finding the report of only one similar case, that of Barnacheff (La Clin. Ophthal., Oct., 1896). He describes a slow inflammatory process in the deep layers of the cornea that he concluded was the continuation of a disease that had originated *in utero*. It closely resembled the above case in all essential, and in some minor, points, although the author designated it a "congenital opacity." He alludes to his groundless fear that the inflammation had been induced by applications that had been made to the eyes, but dismisses this fear after closer study of the affection. The corneæ in his case became entirely transparent.

HYPOPYON-KERATITIS — BREAK IN DESCEMET'S MEMBRANE PRECEDING CORNEAL PERFORATION — PASSAGE OF HYDROGEN PEROXIDE AND FLUORESCEIN THROUGH THE CORNEAL ULCER INTO THE ANTERIOR CHAMBER.

BY JOHN GREEN, M.D., AND ARTHUR E. EWING, M.D.,

ST. LOUIS, MO.

Recently the opportunity has presented itself of examining another specimen of corneal ulcer with hypopyon. The examination of this second specimen affords additional support to the conclusions reached in the case reported two years ago in these Transactions, namely, that

(*a*) One source of hypopyon is through a direct break in Descemet's membrane, either by necrosis or from direct pressure, or both.

(*b*) Another source is from an exudate from the iris.

(*c*) A third possible origin is from the endothelium of Descemet's membrane.

In the case reported to this society in 1896 the hypopyon had existed not exceeding forty-eight hours; the subject was an infant about fifteen months old. In the present case the patient was a woman sixty-three years old; the eye had been blind from glaucoma for nine months, the ulcer had been slower in forming, and the hypopyon had existed for five days. At the time of the enucleation the cornea was denuded of its epithelium over an area of five millimeters in diameter, the defect in Bowman's membrane measuring about three millimeters; the depth of the ulcer at the centre was apparently about one-half the thickness of the cornea; the hypopyon measured about one and one-half millimeters in height. The purulent infiltration was particularly marked about the margins of the ulcer.

Immediately after enucleation the eye was placed in a 5 per cent. formol solution, which was renewed after six hours. After

about two weeks the globe was frozen, and divided in a vertical plane passing through the macula and the centre of the cornea just touching the outer margin of the ulcer. The inner half of the eyeball, including the entire ulcer, was placed in a ¾ per cent. osmic acid solution for four hours; it was then washed for an hour in distilled water, and carried into 10 per cent. alcohol. During the following forty-eight hours it was carried successively from weaker into stronger alcohol, then into absolute alcohol, and lastly into celloidine.

Sections were made through the whole central portion of the ulcer and were preserved in five different groups, the purpose being to discover the special conditions existing in the different parts of the ulcer. In the sections made through the outer portion of the ulcer, Descemet's membrane was found to be separated from the cornea by a mass of pus crowded with leucocytes; the same condition existed also towards the inner margin of the ulcer. Approaching the centre of the ulcer the displacement of Descemet's membrane increases, and in places it appears as if split into fibres; in other places it presents an appearance as if macerated and half dissolved, showing, in thick sections, only as a light line in the purulent mass. More centrally the membrane shows a large perforation, with marked bending of the broken ends backwards, as shown in several of the sections. The space between the cornea and the displaced Descemet's membrane is crowded everywhere with pus cells, the pus extending through the opening in the membrane and banking upon the posterior surface of the cornea, against which it appears to be held by a dense mass of fibrinous and albuminoid exudation apparently generated in the anterior chamber from the iris and perhaps also from Descemet's membrane. This banking of the pus, together with the retaining mass of fibrinous exudation, is like that observed in the case previously reported, except that in the former case the fibrinous web was more sharply defined and its origin more clearly apparent. In the present case the exudation in the angle between the iris and the cornea above, where the activity appears to have been greatest, is nearly homogeneous, or at most

finely granular. The previous glaucomatous process had everywhere obliterated Fontana's space, the iris being, for some little distance, closely adherent to the cornea. About this closed region there is no evidence of recent inflammatory activity either in the cornea or in the iris; the canal of Schlemm is everywhere open. In connection with this formation of fibrinous and albuminoid exudate there is no evidence, either in this case or in that formerly described, of inflammatory activity in the posterior chamber or in the ciliary processes; only at the bottom of the posterior chamber, opposite the hypopyon, are there a few leucocytes, but none above, and no fibrin. The two cases would seem to show that in the beginning the iris supplies the fibrin; this appeared more clearly in our former case, which was of not more than forty-eight hours' standing, and was in a young subject with a previously healthy iris. In the present case the corneal disease had been of longer duration, probably not less than five days, and the corneal endothelium had had more time to become involved in the proliferating process. Moreover, the iris was distinctly atrophied from the old glaucomatous process, with consequent great diminution of its vascularity, which may well account for the much smaller formation of fibrinous exudate in this case.

A new theory with regard to these breaks in Descemet's membrane has lately been advanced by Dr. Elschnig of Vienna ("Zur pathologischen Anatomie der Keratitis suppurativa des menschlichen Auges," Graefe's Archiv. B. XLV, abth. 2, S. 400), who regards them as erosions produced by aggregations of leucocytes on the posterior surface of the cornea, the leucocytes being supposed to be generated from the ligamentum pectinatum, iris, and ciliary body, and the generative process set in action through a chemotactic influence of the inflammatory products of the bacteria in the cornea. Leucocytes from the same sources are supposed to form the hypopyon. The theory is founded on the absence of bacteria in the hypopyon, and the frequency of the occurrence of hypopyon without breaks in Descemet's membrane.

In the case reported by us two years ago there was direct continuity between the pus in the ulcer and that in the deeper cor-

neal abscess. In the present case there is no such direct connection, the two being separated by a band of semi-necrotic corneal tissue; a condition also observed by Elschnig. However, in the most actively infiltrated portions of the cornea, about the margins of the ulcer, the infiltration cells are seen scattered through the cornea, almost or quite to Descemet's membrane, in collections of various sizes.

The cornea is a tissue readily invaded by leucocytes, and there would seem to be no good reason why the same chemotactic influence may not give rise to collections of these bodies, without accompanying bacteria, as well within the cornea itself as on the posterior surface of Descemet's membrane. Such deep infiltrations followed by hypopyon are actually seen in clinical practice. This fact, taken in connection with the histological evidence of our two cases, lends strong support to the view, originally set forth by Verdese, that small abscesses may form in the cornea near Descemet's membrane, and later break through that membrane to empty into the anterior chamber. After the abscess has found an opening, the corneal tissues, now in a semi-necrotic condition, become drained and welded together, as it were, so that after the lapse of a little time, they may show no signs of active inflammatory process. This would account for the semi-necrotic band of corneal tissue seen between the ulcer and the break in Descemet's membrane. Our two specimens illustrate this. In our former case, in which the corneal infiltration between the abscess and the ulcer was continuous, the hypopyon had existed less than forty-eight hours; in this second case, the hypopyon had existed five days or longer, a sufficient time for the abscess to have become drained.

Another very strong evidence that the pus about the break is of an origin other than that of the pus derived from the iris is that the two differ in texture. In the case formerly described, and also in the present case, the pus mass, lying between the cornea and Descemet's membrane and upon the posterior surface of the cornea and extending downwards along the cornea to join the hypopyon, contained no fibrin, being made up wholly of leu-

cocytes in all stages of degeneration. Lying behind and against this pus mass, throughout its whole extent, was a clearly-defined fibrinous exudate, consisting, in our first case, of fibrin and well-preserved leucocytes, probably generated from the iris, and, in the present case, of fibrin, leucocytes, and an apparently alubuminoid exudate, which would appear to have been generated from the iris and probably also in part from the endothelium of Descemet's membrane.

Another fact pointing to one source of the pus being from the cornea is the position of the margins of the opening in Descemet's membrane. This is seen, in both our cases, to be pushed away from the cornea by the pus, the broken ends, as seen in the sections, being directed backwards. Were it, in these cases, simply a question of an erosive process from behind, we should expect to find other disturbance than the destruction of Descemet's membrane, inasmuch as any action of the leucocytes in eroding that membrane would doubtless extend further and cause an erosion of the underlying corneal tissue. In the present case there had been abundant time for such erosion to occur; but, as a fact, the corneal tissue proper remains intact, the leucocytes lying passively against it over the whole space where Descemet's membrane is elevated.

In connection with these histological observations, two clinical cases which have recently come under our observation may be of interest.

CASE I. On the 29th of March, 1898, a laboring man applied for treatment at the O'Fallon Dispensary of the St. Louis Medical College, with an incipient central ulcer of the cornea. He stated that the eye had been struck while breaking a lump of coal nine days before, and that considerable pain had followed the blow. A fellow workman had looked at the eye and said there was "a brown speck on the side of the sight." An "eye doctor," whom he had consulted two or three days later, said that "the eye was sore, but there was nothing in it." The case had been entirely neglected, the eye had steadily got worse, and it had become very painful.

When first seen there was a central deep infiltration of the cornea, measuring 3.5 mm. horizontally and 2 mm. vertically, with a shallower portion extending about 3 mm. downwards; hypopyon measuring 0.5 mm. in height, with threads extending upwards from the pus mass to the cornea behind the ulcer; almost complete posterior synechia, and marked circumcorneal injection. The anterior chamber was of normal depth, the aqueous humor turbid, the lens apparently uninjured, tension normal, vision reduced to recognition of the motion of the hand, and severe pain. The treatment was silver nitrate 1/480 to the conjunctiva, hydrogen peroxide on a small pledget of absorbent cotton to the ulcer, atropia, and a protective bandage (the routine treatment throughout the case.)

March 30th. Eye quieter, and cornea clearer.

31st. Less pain, central infiltration deeper, hypopyon increased. The surface of the ulcer was touched lightly with the electric cautery.

April 1st. Much less pain, and less circumcorneal injection.

3d. No pain, hypopyon a little increased.

4th. In applying the hydrogen peroxide to the ulcer, minute frothy bubbles are formed beneath the corneal epithelium at the upper border of the ulcer.

5th. No increase in the size of the ulcer; hypopyon increased and elevated at its centre; general appearance of cornea good, tension normal, anterior chamber of normal depth. While using the hydrogen peroxide, numerous well-defined bubbles appear in the anterior chamber, rising from behind the deeply infiltrated portion of the ulcer and collecting in the upper part of the chamber. In the deepest part of the ulcer the cornea is apparently destroyed to about one-half its thickness.

6th. Hypopyon a little increased, otherwise no change. From the hydrogen peroxide, to which a little fluorescein had been added, bubbles appear in the anterior chamber, carrying the coloring matter with them. Three hours later the fluorescein was seen to have conspicuously stained the surface of the hypopyon, the bubbles having disappeared in less than half an hour.

The patient remarks that the application of the peroxide "stings a little"; it is always made after cocaine instillation.

7th. No pain, the fluorescein stain has entirely disappeared from the anterior chamber, tension normal, ulcer and hypopyon unchanged; the bubbles from the peroxide now appear abundantly in the anterior chamber, very markedly clearing its turbidity. A minute excavation, at the site of a pre-existing deep infiltration, now extends nearly or quite to Descemet's membrane.

8th. No pain, globe very quiet, anterior chamber of normal depth, hypopyon extending to lower pupillary margin, cornea rather more extensively denuded of its epithelium about the margins of the ulcer; numerous bubbles appear in the anterior chamber, filling the whole upper portion. The peroxide does not attack the denuded Bowman's membrane, but freely attacks the epithelium about the lower margin of the ulcer. After drying the surface of the ulcer, no oozing of aqueous humor can be detected even with a strong lens. This same observation had been made several times on previous days.

9th. The hypopyon now almost covers the pupil, the ulcer at Bowman's membrane measures 3.5 mm. horizontally and 6 mm. vertically. The surface denuded of epithelium now measures about 1 mm. above, 2 mm. to the inner side, and 3 mm. to the outer side of the ulcer. The ulcer is deep above and shallow below; tension normal. The peroxide passes freely into the anterior chamber, but does not attack the denuded Bowman's membrane. As the bubbles accumulate in the anterior chamber the tension of the globe rises to a little above normal, a condition previously observed but not recorded.

10th. As yesterday, except that the ulcer is filled with stringy mucus, and at first the hydrogen peroxide passed more tardily; bubbles still seen in the anterior chamber after one and one-half hours. The peroxide attacks the whole of the denuded cornea, with the exception of a small area at the lower-outer portion 2.5 mm. in diameter. Two small blood vessels have appeared beneath the corneal epithelium, one in the lower-inner, and one in the lower-outer quadrant of the cornea.

11th. As yesterday, except that the peroxide reacts more slowly. After the filling of the anterior chamber with bubbles, the patient was made to incline his head so as to bring them in contact with the hypopyon.

12th. No pain from the treatment yesterday; conditions generally unchanged, except that the hypopyon is thinner. On inclining the head, the bubbles pass freely into and noticeably break up the hypopyon.

13th. Cornea more extensively denuded of its epithelium. The hypopyon is decidedly thinner and does not rise so high in the anterior chamber. Through the action of the peroxide it is broken up, and, after again settling, it is seen to be ragged along its upper surface. Six hours later it measures 3.5 mm. in height, and is level across the top; there are now no shreds extending up to the ulcer. A few bubbles are still to be seen in the anterior chamber.

14th. Only the surface of the ulcer proper is now attacked by the peroxide, which passes tardily at first, but later more freely, into the anterior chamber. After its use, the hypopyon, which was 3.5 mm. high, disappeared entirely. Six hours later it measured 1 mm. in height.

15th. A solitary bubble still remains in the anterior chamber from the peroxide used yesterday. The hypopyon measures about 3.5 mm. in height. By the action of the peroxide, it is broken up into irregular masses and carried by the bubbles into the upper part of the anterior chamber. The cornea is less yellow, more gray over the denuded portion, and pinkish near its lower-outer margin.

16th. The cornea is decidedly pink in the lower portion; the peroxide does not pass into the anterior chamber; the hypopyon is 3.5 mm. high and very thin.

17th. Tension normal; the whole cornea dull and yellowish, the ulcer shallower and smaller, and the epithelium noticeably renewed. Through the clouded cornea it is difficult to distinguish the pupil or the hypopyon. The peroxide attacks the inner portion of the cornea vigorously, also a little of the outer portion;

only a few bubbles pass into the anterior chamber. Patient suffered a little pain early this morning. The globe is very quiet, with only moderate circumcorneal injection.

18th. No pain, tension normal, cornea very much clouded; unable to detect any hypopyon; the epithelium is being rapidly renewed, the pupil barely to be seen; the peroxide attacks feebly the central portion only of the ulcer. During this last week the cornea has become decidedly oval, measuring 9.5 mm. vertically and 11.5 mm. horizontally.

23d. During the last five days the ulcer has become shallow, and the previously denuded Bowman's membrane has become quite covered with a thin layer of epithelium; about the corneal margin there are now very numerous fine blood-vessels. Tension normal; there is apparently no hypopyon; cornea very much clearer.

24th. As yesterday, except that the cornea is clearer and the hypopyon is now reduced to 0.5 mm. in height and is concave at its upper surface. No reaction from the peroxide.

25th. Tension normal; cornea sufficiently clear to show the color of the iris; hypopyon increased to 0.75 mm. in height and level above; *the peroxide again attacks the central part of the ulcer vigorously.*

26th. As yesterday, except that the hypopyon is now 1 mm. in height. *Just below the site of the former deep infiltration the cornea has again become deeply infiltrated and yellowish.* Here and at the lower portion of the ulcer the cornea is vigorously attacked by the peroxide, but not at the site of the former deep infiltration. With a sharp sickle-needle, its back turned towards the anterior chamber, a free vertical incision was made through the newly invaded corneal tissue almost to Descemet's membrane. After this the peroxide acted much more vigorously upon the deeper tissues.

27th. Globe very quiet, only moderate circumcorneal injection, tension normal, hypopyon 1.5 mm. high, ulcer clean; the peroxide now attacks only the central and outer portions of the ulcer.

28th. No change.

29th. No hypopyon, globe soft; there is now a small perforation at the site of the last infiltration; cornea clearer.

May 1st. Anterior chamber shallow, very little hypopyon, blood-vessels extending well upon the cornea from all sides.

6th. Ulcer healing, anterior chamber re-established, a trace only of hypopyon.

11th. Feeble reaction from the peroxide about the site of the recent perforation.

13th. No hypopyon, cornea healing.

18th. Cornea much clearer and no longer oval; through the upper-outer portion a small clear pupil can be seen; good anterior chamber; only a trace of circumcorneal injection; healing about completed, with a rather large opaque scar.

CASE II. In this case, which was first seen April 14, 1898, the right eye had been hurt six years before, while threshing; a small central white scar marked the site of the old injury. The same eye had been again inflamed for about three months; for three days it had been very painful, and vision had failed rapidly. There was a small deep central ulcer of the cornea encroaching on the old scar, with hypopyon 1 mm. high, and fibrinous threads extending from the hypopyon to the site of the ulcer. The ulcer measured 4.5 mm. horizontally and 2.5 mm. vertically; pupil dilated to 6 millimeters, tension normal, anterior chamber of normal depth; the peroxide attacked the ulcer and surrounding tissue vigorously.

15th. The ulcer has extended in depth and in diameter. After cocaine, the whole surface of the ulcer was touched with liquified carbolic acid. This was followed by the peroxide, and some necrosed tissue was then removed with forceps. For six hours after this treatment there was considerable pain, which was controlled by cocaine and atropia.

16th. Slept soundly all night; no pain this morning. The hypopyon has not increased; ulcer clean, and only feebly attacked by the peroxide.

17th. A little pain this morning. The base of the ulcer is infiltrated below, the infiltration being so deep that the peroxide

does not reach it. With a fine sickle-needle, with its back turned towards the anterior chamber, the collection of pus was entered from above, and the corneal layers in front of it divided. The incision, although not carried through the cornea, was immediately followed by a gush of aqueous humor, which thoroughly cleansed the ulcer. Two hours later the anterior chamber was re-established, and several bubbles from the peroxide appeared in it.

18th. No pain, no hypopyon, good anterior chamber, pupil well dilated; a very little purulent infiltration about the lower margin of the ulcer; surface of ulcer attacked only moderately by the peroxide.

19th. Ulcer clean, bottom a little convex (Descemet's membrane); bubbles from the peroxide pass freely into the anterior chamber.

20th. Ulcer clean and filling from the bottom, no hypopyon; the peroxide bubbles do not appear in the anterior chamber.

27th. Healing has continued, no pain, scarcely any circumcorneal injection; the central portion of the cornea is grayish, anterior chamber shallow.

May 2d. As yesterday, except that several bubbles from the peroxide appeared in the anterior chamber.

4th. Anterior chamber shallow, tension apparently normal; peroxide reacts over only a small portion of the ulcer. From this time the healing continued without relapse.

In the first of these two cases there had been an injury to the cornea, which was undoubtedly deeply bruised, possibly perforated. When first seen, however, the ulcer did not seem to be connected with a perforating wound, but looked like an ordinary infected ulcer following an abrasion. At the upper-outer margin of the ulcer the infiltration seemed to extend almost through the cornea, and it was through this part that the peroxide carrying the fluorescein passed, showing a direct connection between the ulcer and a deep corneal abscess. The hypopyon disappeared without any oozing of pus or aqueous through the wound, so far as could be detected, and the cornea at the site through which the peroxide had passed healed. Later a new infiltration started

Fig. I shows the relations of the ulcer, the elevated and partially destroyed Descemet's membrane, the pus from the cornea banked about the abscess and flowing down to the hypopyon, the hypopyon. and the fibrin from the anterior chamber. The detached Descemet's membrane has been slightly retouched on the negative, to show as distinctly as it does in the specimen under the microscope.

Fig. II, from another section, shows the opening in Descemet's membrane, and the detached membrane pushed backwards and surrounded by the pus from the corneal abscess.

Fig. III shows the granular exudate in the upper portion of the anterior chamber, also the cell activity along Descemet's membrane and the anterior surface of the iris.

Fig. IV is taken from the case reported in 1896. It shows distinctly the pus stream from the corneal abscess, as it descends from the abscess to the hypopyon, between the cornea and the limiting fibrinous exudate in the anterior chamber.

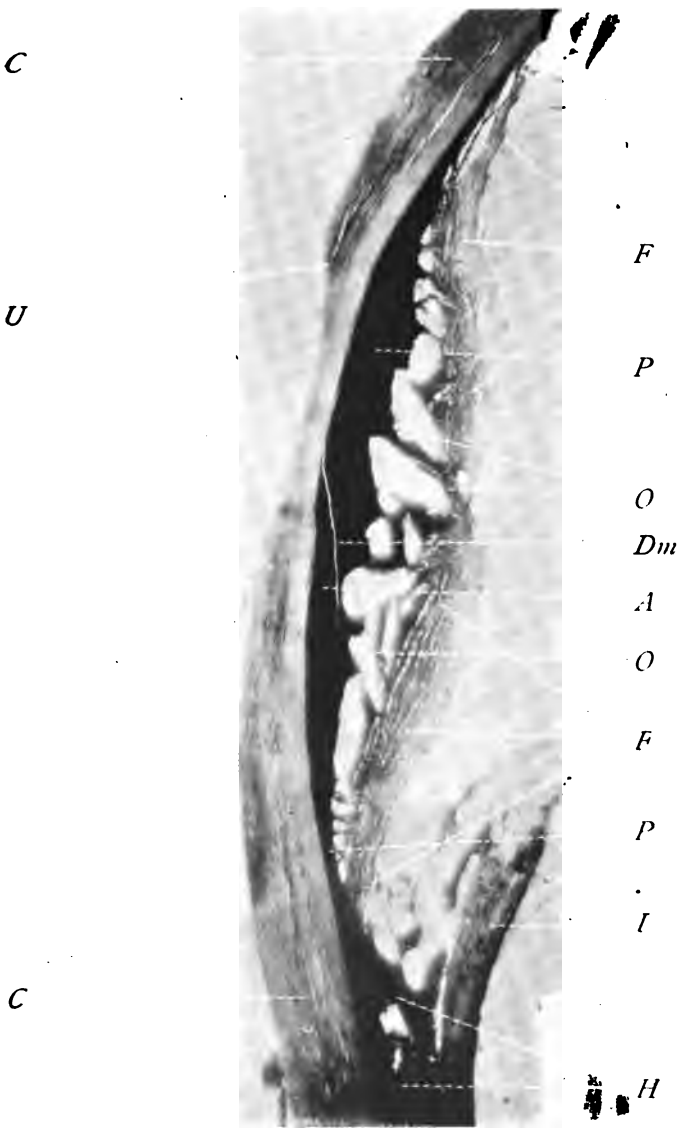


FIG. I.

A, abscess; C, cornea; Dm, Descemet's membrane elevated by the abscess and dissolved in its lower portion; F, fibrin from anterior chamber; H, hypopyon; I, iris; O, spaces caused by shrinkage in the hardening process; P, pus from cornea; U, ulcer.

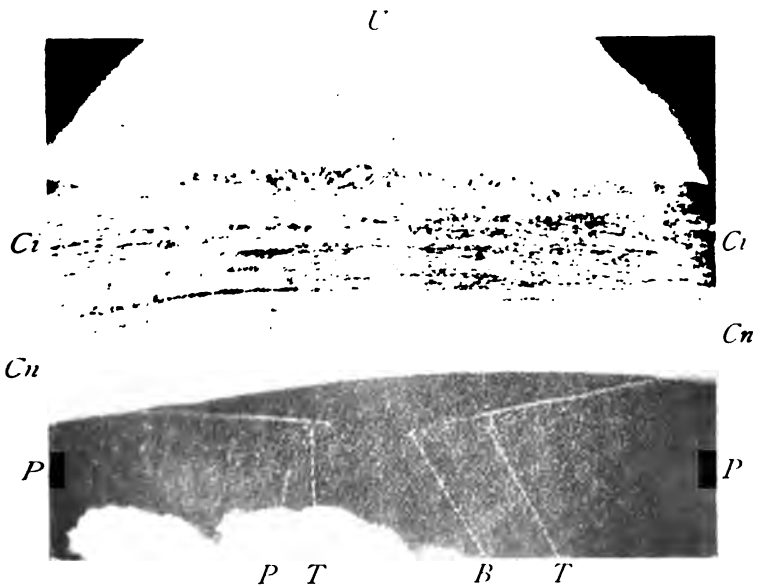


FIG. II.

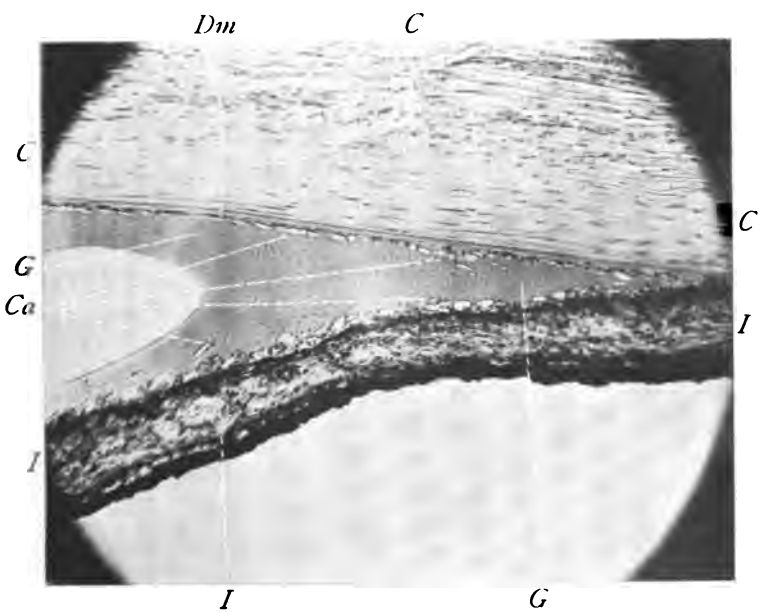


FIG. III.

B, break in Descemet's membrane; C, cornea; Ci, infiltrated cornea; Cn, semi-necrotic cornea; Ca, cell activity in upper portion of anterior chamber; Dm, Descemet's membrane; G, granular exudation in upper portion of anterior chamber; I, Iris; P, pus from cornea about the abscess; T, broken ends of Descemet's membrane; U, ulcer.

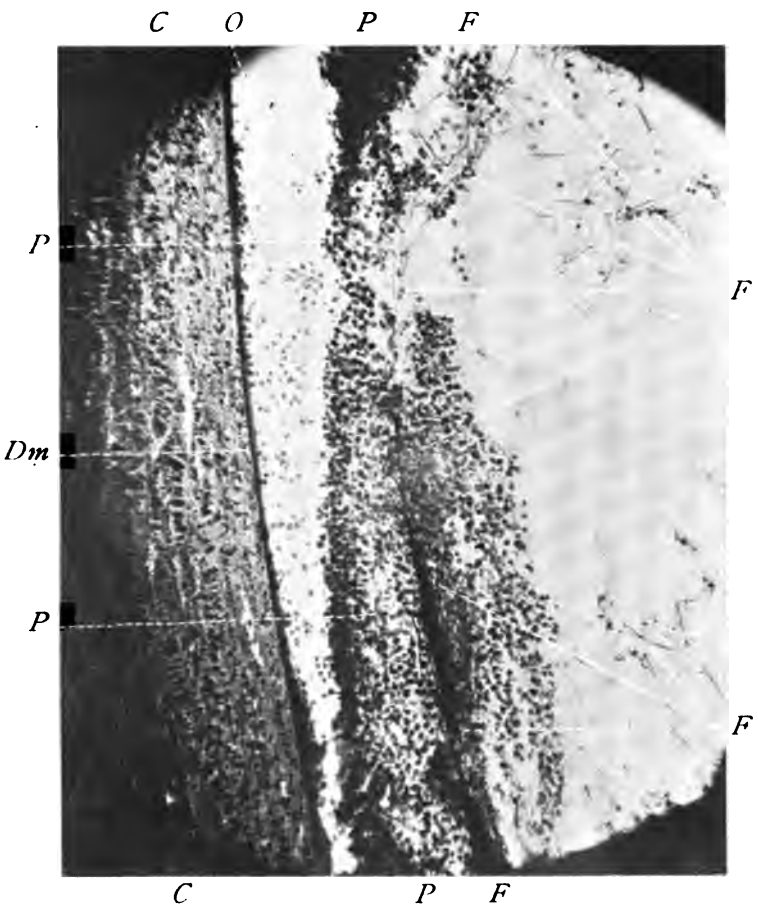


FIG. IV.

C, cornea; Dm, Descemet's membrane; F, fibrin from anterior chamber; O, opening caused by shrinkage in the hardening process; P, pus from the abscess.
[*This photograph is from the first case, reported in 1896*].

below this site, and upon its appearance the hypopyon was re-established. This second infiltration ended in perforation.

In the second case the original infiltration was deep. On its being reached by the needle, there was an immediate escape of aqueous humor, showing a connection between the deep abscess and the anterior chamber. After this there was no re-infection of the ulcer and no return of the hypopyon, although there was still a good deal of circumcorneal injection. In this case a principal source of the hypopyon would seem to have been from the deep suppurative focus in the cornea.

DISCUSSION.

DR. HOLDEN. — The old idea that the pus in hypopyon comes from the cornea seems to die hard. It has been demonstrated time after time that the leucocytes in the anterior chamber, like those in the cornea, come from the vessels about the periphery of the cornea and in the ciliary body and iris. In rare cases the membrane of Descemet is ruptured without perforation of the cornea, and pus in the cornea is found to be in direct connection with pus in the anterior chamber, but even here we have no grounds for believing that the pus has passed from the cornea into the anterior chamber. In fact, Elschnig, who has recently described several cases of this condition in eyes with serpent ulcer and glaucoma, finds that the erosion of Descemet's membrane begins from behind, and that if, indeed, there is any passage of leucocytes through the break, it is in the direction from the anterior chamber into the cornea.

DR. GREEN. — I had expected to have for exhibition a series of photographs of sections bearing directly upon this point, but as they are not here the subject cannot now be adequately discussed. The photographs will be reproduced with the published paper. Elschnig's work has been carefully considered in connection with the study of our specimens.

SPONTANEOUS EXPULSION OF FOREIGN BODY FROM ANTERIOR CHAMBER.

BY J. P. WORRELL, M.D.,

TERRE HAUTE, IND.

Master L., aged 15, two weeks previous to his first visit to my office, received an injury of the right eye while exploding a gun-cap by striking it with a hammer. His sight was impaired at once, and the eye became red, with, however, but little pain. His physician reports the appearance of pus in the anterior chamber at the end of a week, though probably this was a deposit of lymph. The treatment had been some simple wash. The boy was brought to my office on the 6th of January, 1883, when the following conditions were found:

Sclera deeply engorged, being almost livid in color; cornea hazy throughout, preventing any view of the iris. The lower half of the cornea was entirely opaque and bulging. Tn. The pain was slight, with occasional exacerbations. Perception of light and projection good. Ordered atropia and compressed bandage. Under this treatment the eye in a few days became entirely painless. Scleral engorgement lessened, and clearing of the cornea proceeded to a degree permitting a comparatively satisfactory view of the upper part of the iris, which appeared to be healthy. Pupil was moderately dilated, central portion of it being occupied by a small deposit of lymph. The lower portion of cornea, involving its lower and nasal half, is still cloudy; the bulging previously mentioned unchanged. Across it run a few small vessels from the adjacent corneal margin. Upon its surface, 1½ mm. in length and very close to the limbus, was seen a fine horizontal linear cicatrix. Behind this portion of the cornea as distinctly seen an ovoid body, yellowish in color, with apparently well-defined outlines, its position not undergoing any change in alteration of the position of the eye. That portion of ciliary region corresponding to the position of the yellowish mass con-

tinued to be deeply engorged. Other portions of the sclera becoming pale and nearly normal in appearance. Absolute freedom from pain; no tenderness on pressure.

On the 13th of same month, my notes state that under the continued use of atropia and compress bandage the cornea had cleared up until there remained but a slight diffuse opacity in the lower and inner quadrant. In consequence of the bulging at this point, the anterior chamber was very deep. There was now distinctly seen an oval yellowish colored mass 4 mm. in length, lying in the bottom of the chamber and rising about 2½ mm. towards the pupillary border. The pupil was still dilated upwards, circular in shape, except that at the lower and inner portion was a notch due to rupture of the circular fibers. Behind the notch, extending nearly to the center of capsule, a sharply-defined line, appearing black when seen with the ophthalmoscope, and gray by lateral illumination, due to a slight rupture of the capsule, was seen. In its neighborhood a faint lenticular opacity was recognized. The sight much improved and fundus readily illuminated.

On the 16th of February the conditions had much improved. Ciliary injection had disappeared save in the neighborhood of the yellowish mass. The cornea had cleared up, showing on its inner surface, or in the innermost layers near the limbus, a dark point apparently from the infiltration of pigment. Just above this point under examination by oblique light, there came distinctly into view a bright reflecting surface, the metallic nature of which could not be mistaken, nearly square in outline, being 1½ mm. in length. This could also be seen by ordinary daylight, the cornea being sufficiently clear to permit a clear view of the body. It lay in a plane nearly vertical, its upper edge leaning backwards about 15° from the vertical, and being at an angle of about 40° to the surfaces of the cornea. Its lower margin was engaged in the innermost layers of the cornea, the transparent tissue of which permitted an easy examination.

Operation for removal of the foreign body had been suggested at various earlier times, but I now recommended its extraction

with some importunity. This, however, was declined. Vexed that so obvious a course should be refused, I doubtless manifested my impatience and expressed a wish that the patient assume, thereafter, the responsibility of the case.

I did not see it again until the 24th of the same month. The eye was then quiet. Diligent search failed to discover any sign of the foreign body. The yellowish mass in the anterior chamber had also disappeared, so that I was able to look down into the bottom of the chamber to the utmost limit of the iris. The patient stated that the day before something had scratched the eye "right smart." He said he had rubbed the eye vigorously, after which the irritation ceased. At this time the eye was so quiet it seemed the case had reached its termination. No indication existed for further treatment. However, I requested him to call occasionally and report.

On the 5th of March, nine days later, he came to the office exulting in the possession of the foreign body. He said that the day previous, feeling something scratching the eye, he rubbed it with a pledget of cotton, thereby removing the point of irritation to the inner canthus. Removing some secretion which had gathered there, he found in its midst a small piece of bright copper, which I at once recognized as the foreign body that I had seen in the anterior chamber. This was found to be a flat piece of copper of the thickness of writing paper, about 1½ mm. in length, rather rough in fracture, one edge slightly turned up. The eye was quiet and presented the following appearance:

No ciliary injection. In the lower-inner quadrant this membrane presented a slightly increased curvature, which portion was traversed by a crescentic nebula having its extremities at the limbus and surrounding the dark area where the pigment had infiltrated the cornea tissue. From a point in the horizontal margin of the anterior capsule, just to the nasal side of the center of the pupil, there is seen a white band which runs downward and forward, reaching and becoming adherent to the cornea at the position of the black area described. To this band the torn edges of the iris became adherent, drawing that portion of the iris forward, thus encroaching upon the depth of the anterior chamber.

A few days later, when the effects of the mydriatic had passed off, the pupil became eccentric, so that the upper end of the white band reached the upper margin of the pupil, dividing that space into two unequal portions. Sight was 15/XL.

This case I believe to be quite unique in that it is one of spontaneous expulsion from the anterior chamber of the eye of a foreign body which had passed entirely through the cornea and was freely movable within the anterior chamber, and also unique in its expulsion without ulceration or other destructive change. That it must have passed entirely through the cornea and become freed from that tissue is evident by a comparison of the minute size of the offending body and the distance from the point of entrance to the point of injury in the iris, this being in a vertical direction at least 5 mm. Assuming, as was probably the case, that the aqueous humor had not been lost, the distance between the point of entrance and the point of injury to the capsule must have been considerably increased. It is probable, therefore, that the foreign body was driven entirely through the cornea, traversed the anterior chamber, cut the sphincter of the iris, lacerated the anterior capsule, after which it had fallen into the anterior chamber, where it had become surrounded by a mass of lymph; that the lymph had been ultimately absorbed and that the foreign body had made its way — whether at the exact point of entrance or not it is impossible to say — by absorption of the tissue in front of it, through the cornea — finally escaping unassisted from the eye.

From the limited opportunities which I have had of consulting our literature, I have been unable to find any report of a similar case. Norris and Oliver mention that "very minute foreign bodies are sometimes spontaneously extruded from the eye," this taking place during attacks of inflammation when the minute body lacerates through its point of entrance. In most all of the cases referred to the inflammation was destructive and fatal to the eye.

Since writing the above my attention has been called to a case of "spontaneous extrusion through the original point of entrance in the corneal membrane," in a report by Dr. Oliver,

published in the Annals of Ophthalmology for April, which presents more points of similarity to the case which I report than any other I have found.

DISCUSSION.

DR. H. F. HANSELL. — About three years ago I reported a case similar in some respects to Dr. Worrell's, in which a piece of steel which had been in the anterior chamber, according to the patient's story, for fifteen years, spontaneously extruded through the cornea. The wound of entrance was invisible. The steel gradually opened a way for itself through the cornea, and more than half of it was exposed when I saw it, so that I simply helped it out with a pair of forceps.

DELAYED UNION AFTER CATARACT EXTRACTION.

BY GEO. C. HARLAN, M.D.,

PHILADELPHIA, PENN.

So far as I have been able to learn, there are no statistics to indicate how long the wound may remain open after extraction without necessitating a grave or hopeless prognosis of the final result. The text-books generally do not refer to the subject, and tabular reports of operations give no definite data. As some of my friends, as well as myself, have looked in vain for comfort when the anterior chamber has remained empty after the first few days, I have thought it might be worth while to bring the subject before the society.

A few months ago I operated on a lady eighty-three years of age. She was in fair health, neither diabetic nor albuminuric, but too feeble to take a journey, and the operation was performed at her distant home, but she was left in charge of a good general surgeon and an experienced trained nurse. The operation was entirely smooth, there was no prolapse of the iris, and the pupil remained round and central. The usual compress and bandage were used, and after the second day the eye was carefully douched

daily with warm boric solution by merely drawing down the lower lid without raising the upper, and atropia was instilled. On visiting her ten days later I was surprised to find not the slightest indication of closure of the wound. There had been no pain, and the eye was quiet. The pupil was round and central — 4 mm. in diameter — but lay directly against the cornea. The wound was in perfect apposition and there was no infiltration of its edges; in fact, it was almost impossible to locate it. Her general condition was not good; her tongue was dry, her appetite was failing, and her spirits somewhat depressed. She had been sitting up in bed, but was indisposed to get up. She was urged to dress and to resume as far as possible her usual habits and ordinary diet, and quinine and strychnine and a little brandy were ordered. At my next visit, seven days afterwards, the anterior chamber was normal and the wound was firmly closed. Just when this occurred it is not possible to say, as, fearing infection or disturbance of the wound, I had left particular directions that the lid should not be raised. The edges of the wound were now hazy, though the rest of the cornea was clear, and the base of the iris was adherent to the corneal cicatrix throughout, slightly dislocating the pupil upwards. V. = 1/5, with probability of great improvement by capsulotomy and cylindrical correction.

This case called to my recollection one that I met with a good many years ago. As the patient had only one eye, the general condition was not good, and the lens was white, a preliminary iridectomy was performed. There was a slight escape of fluid vitreous when the incision for extraction was made, and the lens was removed in its capsule with a wire loop, without further loss. There was no vitreous in the wound, and it remained in perfect apposition but refused to unite for three weeks. A compress with bandage was used and atropia was applied. Finally, with the approval of Dr. Norris, who saw the patient in consultation, I applied the point of a mitigated nitrate stick, very lightly, along the whole course of the wound, and it closed in a few days afterwards. V. = 20/30 and remained good, though the patient's general health failed, until she died a few years afterwards in an insane asylum.

Carl Barck of St. Louis has recently* reported two cases in which the anterior chamber remained open for more than two weeks in one and for two weeks in the other, with an excellent final result in both; and another which ended in corneal suppuration at the end of eighteen days. Berry alludes to the failure of the wound to close after two days as an unusual, though occasional, occurrence. Wecker says "it is a clinical fact that the union of the lips of the wound may, without inconvenience, be retarded for five or six days, either by repeated re-opening or by a faulty coaptation, without the existence of the eye being menaced, provided that infection be carefully guarded against during this period so propitious for inoculation." Becker, in Graefe-Saemisch, says he has seen the anterior chamber remain open for five or six days, even after perfectly normal extractions, and that the eye, as a rule, does not present any symptoms of irritative reaction, and the termination is a favorable one. He therefore regards a late restoration of the anterior chamber almost as a favorable condition for the final result. He adds that these favorable cases must not be confounded with those in which union is delayed by increased intraocular pressure, when one may be thankful if the wound finally heals with a cystoid cicatrix. Jacobson† reports a case in which a good result was obtained after the wound had been open for more than four weeks. "The patient had some blepharo-spasm and the aqueous escaped regularly, as often as I left the bandage off, during the first three weeks. After I had convinced myself of the constancy of the condition, I kept the eye closed by a compressive bandage for ten days and nights in succession, after which time the wound was closed."

Becker thinks that the cause may lie in the character of the wound, as, if ragged, it offers an imperfect apposition, but is more frequently to be found in lens substance or capsule lying in the wound and holding it open.

In a recent discussion of this subject at two meetings of the Societé d'Ophthalmologie de Paris (November 3, 1896, and March 9, 1897), Vignes reported two cases in which the wound

* American Journal of Ophthalmology, September, 1897.
† Graefe's Archives, Vol. XI, 194.

remained open in one for ten days and in the other for twenty, and finally healed without corneal opacity and with good vision. The first patient was diabetic and catarrhal. In the second there was no albumin or sugar, but a decided diminution in the amount of urea, which he suggests might have some connection with the delay in union. In this case, in which union was delayed for twenty days, the pupil was slightly drawn up by adhesion of the base of the iris to the lips of the wound, but this did not occur until two or three days before the closure. This is just what occurred in the case that I have reported, and it seems likely that this adhesion of the iris promoted the union by checking the flow of aqueous humor.

Valude claimed rapid effects from iridectomy and said he had seen the anterior chamber close twenty-four hours after it was performed in cases that had shown no tendency to unite for several weeks. Terson also referred to a case in which the anterior chamber remained open for a month and a half, and closed completely two days after an iridectomy was performed. He thinks that delayed union is much more frequent in the simple than in the combined operation.

Vacher, in a case which remained for twelve days without reaction and without tendency to union, touched the lips of the wound with a solution of iodine, and the next day it commenced to cicatrize.

Bourgeois and Jocqs reported cases in which delayed union, in one case for two weeks and in the other for three, was attributed to entropion. In the former the anterior chamber was established the day after the entropion was relieved by operation, and in the latter the wound cicatrized completely forty-eight hours after the eye was left unbandaged.

Koenig referred to a case in which union was delayed for twenty days. He thinks the facts that union usually occurs promptly in diabetics and often in patients with diminished urea, while it may be delayed in patients whose condition is quite normal, and that the vitality of the cornea is shown by its continued transparency, make it difficult to accuse the general condition;

and most of those who took part in the discussion attributed delayed union to local rather than to general causes, or, at least, considered the latter as only predisposing.

Since this discussion Valois[1] has reported the case of an alcoholic subject, seventy-four years of age, on whom an unsuccessful operation had been performed on the other eye. There was no sign of union at the end of nine days, when the wound was lightly touched with the actual cautery, and three days later it had firmly cicatrized. There was some corneal opacity, but V. = 20/50. He also refers to another case in which the wound closed at the end of four weeks under the use of simple compress and bandage. The number of cases of delayed union reported by French surgeons since attention was called to the subject, makes it seem probable that delayed union is much more frequent than has generally been supposed. The fact that Becker, with his extensive experience and well-known accuracy of observation, had never seen the anterior chamber remain open for more than five or six days after normal extraction, suggests the query whether modern methods of operation and the use of cocaine may have any connection with this complication. With a view to getting some idea as to the frequency of delayed union, and, if possible, as to the conditions that cause it, Dr. C. J. Kistler, resident surgeon of Wills Hospital, has examined the records of five hundred consecutive extractions performed at the hospital. Cases which ended in sloughing of the cornea, panophthalmitis, or destruction of the eye by chronic cyclitis were excluded, and only uncomplicated cases are noted. In four hundred and seventy-four of the five hundred cases the anterior chamber was reformed in less than five days, in nearly all of these within forty-eight hours. In twenty-six cases the union was delayed longer than this time, and a tabulated report is given of such cases. In nine the wound remained open for five days, in two for six days, in two for seven days, in two for ten, in three for eleven, in two for twelve, in one for thirteen, in one for fifteen, in one for sixteen, in one for seventeen, in one for nineteen, and in one for twenty days. Fifteen were simple operations and eleven combined. In twenty it is

[1] Recueil d'Ophthalmologie, January, 1898.

noted that no complication occurred during the operation. Of the remaining six, prolapse of the iris occurred in four cases and was excised in two and replaced in two. There was slight loss of vitreous in one case and a bead of vitreous appeared in the wound in another. All very common accidents in cases that follow a perfectly normal course. There were also few complications, beside the delayed union, during the course of treatment. In one case considerable cortical debris was left in the anterior chamber. In one a small shred of vitreous was removed from the wound on the third day and it closed two days later. In two cases there was delirium. In one a prolapse occurred the day after the operation, but subsequently smoothed down completely without interference, and the anterior chamber was reformed on the sixteenth day. V. = ½. In one prolapse occurred the second day after the operation. On the sixth day, as the chamber still remained open, preparation was made to perform iridectomy, but under etherization the iris was spontaneously replaced and the wound was closed the next day. The ages of the patients varied from forty-five to seventy-five, a large proportion being over sixty. One is recorded as neurotic and two as feeble, but generally their condition is stated as good or fair. There were no diabetics or albuminurics among them. The degree of vision attained was from 1/5 to 1; a case in which the wound did not close for fifteen days being included in the latter. In no case was the eye lost.

The various causes of delayed union that have been suggested are:

An irregular or ragged incision.

The presence of bits of capsule, lens debris or vitreous shreds in the wound.

Hernia of the iris.

Adhesion of the iris to the posterior lips of the wound.

Pinching of the conjunctiva or iris in the angles of the wound. Entropion occasioned or increased by the dressing.

Disturbance of the wound by too frequent examinations and dressings.

Failure of reparative power due to something in the condition of the patient.

Excessive secretion of aqueous humor.

There is no special note as to the character of the wounds in these twenty-six cases, but as they were made by the same surgeons who operated on the rest of the five hundred, it may be presumed that they were made with about the same average skill. In my own case the incision was better than my average, and on the tenth day its margins were in such close apposition that it could scarcely be distinguished. In two cases there was possibility of vitreous in the wound; in two the dressings were disturbed by the patients in delirium, and in two the delay in cicatrization seemed to be caused directly by hernia of the iris. As to simple adhesion of the iris to the posterior lips of the wound, it occurred in the case reported only just before the anterior chamber was reformed, and seemed to me rather to promote cicatrization by checking the outflow of aqueous humor. Also in the case reported by Vignes, in which the wound remained open for twenty days, a similar adhesion occurred two or three days before it closed. There was no entropion in any of the cases, and nothing unusual in the dressing. This leaves twenty cases in which there was no known local cause. The probability that something in the condition of the patients was an important factor seems increased by the fact that in two cases the delay occurred in both eyes, while in a third the wound of a preliminary iridectomy, performed a month before the extraction, remained open for five days. In one of the cases reported by Dr. Barck there was retarded union — eighteen days — in each eye. In the case just reported cicatrization was evidently coincident with the improvement in the patient's condition, which had been much depressed, and I believe that a mistake was made in keeping her too long on an unusual diet and in not insisting upon her getting out of bed.

As for treatment: So many cases have been reported in which excellent results have been attained, although the wound has remained open without interference for weeks, that a conservative course seems to be generally indicated. The outflow of

aqueous humor is a protection against infection, but it is not known how long this flow may continue without endangering the nutrition of the ball. A permanent fistula is likely to result in atrophy. With the present light upon the subject, if the wound is clean and in good apposition, I would be inclined to give the compress and atropia at least a month's trial. If there is capsule or lens debris in the wound, it may be well to remove it with the spatula. A prolapse of the iris should be excised, unless it can be readily replaced. Iridectomy, even when there is no prolapse, is reported to have been promptly successful in a number of cases, and, whether it acts by merely freshening the wound or by modifying the secretion of aqueous humor, it seems to have a basis in practical experience. Cicatrization followed stimulation of the wound, by nitrate of silver, solution of iodine and the galvanic cautery, in three cases. In case of entropion it becomes a question between relieving the condition by operation and removing the bandage. Berry says, in his text-book, that when the wound remains open longer than forty-eight hours, a light dressing that makes no compression on the ball should be substituted for the compress and bandage.

Name.	Age.	Sex.	General Condition.	Kind of Operation.	Complications during Operation.	Wound Closed. Days.	Result. Vision.	Result. Refraction.	Remarks.
M. B.	60	Female	Good.	Simple.	Very refractory patient and uncontrollable.	5		$\frac{1}{3} = +11.$ S. ⊃ $+3.50$ cy × 160°.	Eye remained quiet. Capsulotomy required.
G. R.	76	Male.	Fair.	Simple.	None.	5		$\frac{1}{1.5} + 11.50$ S. ⊃ $+3.00$ cy × 35°. Add $+3.00$ for close.	Patient became delirious after operation and had to be allowed out of bed sooner than usual.
P. F.	60	Male.	Fair.	Combined.	None.	5		$\frac{1}{8} + 10.$ S. ⊃ $+2.$ cy × 180°.	Had a vomiting spell and was slightly delirious after operation. Removed dressings in delirium.
R. K.	70	Male.	Good.	Combined.	None.	5		$\frac{1}{10} + 10$ D. ⊃ $+3$ cy × 165°.	Eye quiet during convalescence.
M. E.	63	Female.	Good.	Simple.	None.	5		$\frac{1}{4} + 11$ D. ⊃ $+3$ cy × 150°. Add $+3.0$ for near.	Considerable cortical in ant. chamber.
E. W.	45	Female.	Good.	Combined.	None.	5		$\frac{2}{5} + 8.000$ ⊃ $+2.50$ cy × 180°.	Nothing unusual noted.
P. K.	68	Male.	Fair.	Simple.	None.	5		$\frac{1}{3} + 10.50$ 2 $+1.00$ cy × 45°.	Capsulotomy required. Moderate Iritis during convalescence.
E. W.	60	Female.	Good.	Simple.	None.	5		$1 + 12.0$ ⊃ $+6$ cy × 180°.	Nothing unusual.
J. S.	55	Female.	Fair.	Simple.	Prolapse of the iris which could not be reduced and an iridectomy was done.	5		$\frac{1}{2} + 4.$ S. ⊃ $+3$ cy × 180°.	Small shred of vitreous found and removed from the wound three days after operation.
A. P.	65	Female.	Fair.	Simple.	None.	6		O. D. $\frac{1}{2} - 10$ S. ⊃ $+3.$ cy × 180°.	Nothing unusual.
A. P.	65	Female.	Fair.	Simple.	None.	6		O. S. $\frac{1}{2} + 10$ S. ⊃ $+2$ cy × 180°.	Both eyes ran about the same course.
J. L.	60	Male.	Good.	Simple.	Iris prolapsed. Was washed back. Patient squeezed and expelled lens. No vitreous lost.	7		$\frac{1}{3} + 9.00$ S. ⊃ $+3$ cy × 180°.	Iris prolapsed again on second day after operation and iridectomy was to be done under ether on sixth day. During etherization iris simultaneously replaced itself and the wound was closed next morning.
J. E.	51	Male.	Fair.	Simple.	None.	7		$\frac{3}{5} + 10.$ sphere.	Nothing unusual. Right eye wound open seventeen days. See below.
M. I.	59	Male.	Fair.	Combined.	None.	10		$\frac{1}{8} + 60$ ⊃ $+6$ cy × 90°.	Two days after operation considerable catarrhal discharge appeared. Dressings left off. Wound showed some infiltration.
E. S.	70	Male.	Good.	Combined.	None.	10		$\frac{2}{3} + 9.$ S. ⊃ $+4$ cy × 165°.	After operation patient had a vomiting spell. No opiates used. No pain and very little reaction in eye.
R. H.	71	Male.	Fair.	Prelim. Indect.	None.	11		$\frac{2}{8} + 10.$ S. ⊃ $+4.$ cy × 180°.	After the preliminary iridectomy wound was open five days. One month between two operations. (O D went into Panop. after extraction.)
J. B.	75	Male.	Fair.	Combined.	Loss of some vitreous.	11		$\frac{1}{3} + 8.00$ S. ⊃ $+6$ cy × 180°.	Very little reaction during convalescence.

Name.	Age.	Sex.	General Condition.	Kind of Operation.	Complications during Operation.	Wound Closed. Days.	Result.		Remarks.
							Vision.	Refraction.	
M. F.	65	Female.	Good.	Combined.	Simple opr. attempted. On acct. of tendency to prolapse section was made. Bead of vitreous presented but did not prolapse.	11	2/5 + 10. S. ⊃ + 2.25 cy 420°.		Slight infiltration of corneal wound.
S. B.	67	Male.	Poor.	Combined.	Very big lens removed with difficulty.	12	1/5 + 10 sp.		Patient's general health failed so rapidly that she was discharged from the hospital as soon as possible.
E. W.	69	Female.	Good.	Simple.	After delivery of big lens the iris showed an uncontrollable tendency to prolapse and was cut.	12	1/1 + 10 S. ⊃ + 1. cy × 180°. Add + 4.50 near.		No unusual occurrence.
M. C.	50	Female	Very Neurotic.	Combined.	Patient very nervous and restless. No accident.	13	1/5 — Refraction missing.		Patient ungovernable during dressings and squeezed lids each time. Capsulotomy required, with considerable reaction.
F. H.	63	Male.	Fair.	Simple.	None.	15	1 + 11 S. ⊃ + 1. cy × 180°.		Nothing unusual in convalescence. Eye quiet, no pain Simply sluggish.
J. F.	71	Male.	Weak.	Simple.	None. Iris showed a tendency to prolapse, but was washed back easily.	16	1/2 — + 12. S. + 4 for near.		Day after oper. he had pain and iris was found prolapsed. Slowly healed and prolapse smoothed out completely.
J. E.	51	Male.	Good.	Simple.	None.	17	3/5 + 11 S.		Nothing unusual. See above. Wound on O. S. open seven days.
Mrs. F.	63	Female.	Medium.	Combined.	None.	19	1/8 + 10 S. ⊃ + 4 cy 180°. Add + 4 bifocal.		Cornea had become infiltrated in its upper quarter — and the coloboma in iris had contracted almost completely. Iridectomy was done, downward, and the recorded vision obtained.
B. B.	69	Male.	Fair.	Simple.	None.	20	1/5 + 9 S. ⊃ + 1 cy × 45°.		No unusual or untoward symptom or condition during entire convalescence.

SUMMARY.

Wound closed in Hours.	Uncomplicated Cases.	Complicated Cases.	Total.
48	369	30	399
72	31	9	40
96	15	20	35
more than 120	retarded report		26
			500

Where wound closed in less than five days: — COMPLICATIONS NOTED WERE:

Too small corneal incisions.
Soft and collapsed corneæ.
Puncture of iris during incision.
Prolapse of iris.
Bruising of the iris in delivery of large lens.
Diabetic Cataract — (3 days).
Soft and milky lens.
Dislocation of the lens requiring the introduction of loop or hook.
Forcible expulsion of lens by patient.
Loss of vitreous.
Bleeding into the anterior chamber.
Removal of posterior capsule or attempt at removal.
Prostrated patient. (In depraved health.)
Unruly, ungovernable, and nervous patients making the operation difficult and causing unnecessary traumatism to the parts.

DISCUSSION.

DR. H. D. NOYES. — In one instance this experience occurred to me. It was a clergyman over seventy, and the wound failed to unite for more than a fortnight. It was not simply that the anterior chamber remained empty, but the edges of the wound were inclined to evert. There was no infiltration, no opacity, nor secretion, nor pain. The operation was by Graefe's method. The pupil remained clear. In the course of time the wound healed and the man enjoyed good vision for more than ten years.

DR. GRUENING. — I think that one cause of the eversion of the lips of the wound, which I have also observed frequently, is the fact that the operation has been done within the clear cornea. If we make a small conjunctival flap, the wound heals very rapidly, and I now always aim to have such a flap.

DR. W. B. JOHNSON. — Do you do the simple operation?

DR. GRUENING. — Yes. I am speaking of the simple operation.

DR. MYLES STANDISH. — It is my custom very frequently to do a simple extraction with what we call a Chandler buttonhole. After the operation of extraction is completed, a minute opening is made through the iris, perhaps ½ mm. in diameter, and as far back as possible. It is done for the prevention of prolapse of the iris, and seems to succeed admirably. In two instances in which I have done this I have had a sinus left just over this little opening, showing that the flow of aqueous was sufficient to keep it from healing at that point. It stayed open for several weeks, but closed promptly when I touched the wound with the mitigated stick.

DR. H. KNAPP. — I have seen that often, and once the closure was followed by glaucoma, I think, because probably a piece of conjunctiva was in the wound. We frequently see when we have made a conjunctival flap that there is a gaping of the wound which the conjunctiva bridges over.

MEMORANDA ON PROTARGOL IN THE ANTISEPTIC PREPARATION OF THE CONJUNCTIVA PRIOR TO CUTTING OPERATIONS OF THE EYEBALL.

By B. E. FRYER, M.D.,

KANSAS CITY, MO.

To our colleague Alt of St. Louis I believe should be given the credit of first calling attention to the value of protargol in ophthalmology; at any rate, this is true as far as this country is concerned. And in the first number of a new journal on dermatology, edited by Max Joseph in Berlin, Neisser, of gonococcus fame, published an account of some of his experience with this drug in general surgery (specific urethretis). Neisser states, in referring to some experiments as to the microbicidal value of this silver salt, "That in tubes of agar to which protargol had been added the following microbes, prodigiosus, staphylococcus aureus, tetragenus, pyocyaneus, diphtheria, cholera, and growth occurred when the strength was 1.5000; while 1.2000 the tubes remained sterile."

"Solutions of protargol used clinically possess an antiseptic power greater than corresponding solutions of nitrate of silver, argentamin, and of argonin, and the above-mentioned microbes are killed more rapidly by protargol than by the other salts of silver."

Neisser adds that while his researches in relation to the destruction of the gonoccus by the drug are not yet ended, his last series of experiments exhibit the bactericidal power of protargol in a remarkable manner.

My experience with protargol began four or five months ago, and I have used it with success in gonorrhoeal ophthalmia, catarrhal conjunctivitis, follicular trachoma, and for more than three months I have been applying it for the purpose of rendering the conjunctival sac aseptic. It is for the latter purpose I desire here very briefly to call attention to protargol.

I have been using for some time sublimate solutions for ren-

dering the conjunctival sac aseptic, and while they are undoubtedly efficient, the strength, or rather the dilution, requisite for safety interferes with quick results. I find with protargol I can render the conjunctiva aseptic much sooner and without any irritation.

My method is as follows: The face, brow, temple, and lid are washed with soap and water, and then with a 2½ per cent. solution of carbolic acid. The conjunctival sac is now flushed with a 2 per cent. solution of protargol, and a few layers of sublimate gauze are placed over the lids and held in position by strips of isinglass plaster. Washing the lids and their surroundings and the conjunctival flushing are repeated twice a day until the conjunctiva is surgically clean. This may require a week or ten days; the time need not be regretted. The flushing should be thoroughly done; the patient's head ought to be thrown well back and the upper lid well retracted, and the solution carried up to the fornix conjunctivae; the lower lid should be drawn down and the fluid sent to the lower portions of the mucous membrane. These flushings should be done twice at each dressing, and ought to be made, as I have said, twice a day.

A microscopic examination of the secretion should be had every day or two, looking for pathogenic microbes and also for pus cells; for if we find the latter, although no microbes are discoverable, they have simply escaped us, the purulent corpuscles indicating at least the very recent presence of germs. In which event we continue the antiseptic effort longer, until both microbes and pus cells are absent; then the eye may be considered clean.

It may be said that through the lachrymal ducts we can have a re-infection of the conjunctiva very speedily, and while this is true, I believe that we shall have a sufficiently long interval before sepsis through that source recurs for cicatrization — that the protargol solution will have rendered the lachrymal canal aseptic and have made this aseptic interval possible from the canal carrying off any excess of the solution, producing asepsis of these channels as it flows through them.

We can only positively determine definitely as to when a con-

junctiva is free from microbes by microscopic examination of the secretions from the membrane, but then clinically we may feel in a majority of cases that we have produced asepsis when we find no purulent discharge upon our dressings, at the angles of the eye, or upon the lid edges, though the microscopic test is absolutely certain.

It will surprise many who have never applied antiseptic dressings to an eye which apparently is surgically clean, to find the amount of muco-purulent discharge which may be found on the gauze, or on the lids, or at the inner canthus, and the surprise will be added to if this discharge is examined microscopically.

The time requisite to make a conjunctiva aseptic varies, of course. In a hospital, where trained assistance can be had and the conjunctival sac is flushed thrice a day, but few days are needed, but if the patient is an office case, and can be seen only once each day, of course longer time is required.

Where a case requires immediate operation, as in acute glaucoma, we can only make a few closely following flushings and operate; but I believe after these we can proceed with more safety, so far as antisepsis is concerned, than we could after an equal number of sublimate solution instillations.

I need not give details of cases, but will merely add that while the operations I have done upon eyes made aseptic by protargol have not been very numerous, the results have been most satisfactory, while several of the cases were anything but promising. Six of the operations were cataract extractions and seven of iridectomies. Two of the cataracts were in extremely unmanageable persons, and one of these took off the dressings on the fourth day after the operation and rubbed the eye considerably, yet the result was perfect.

As I have stated, the strength of protargol used was 2 per cent., yet possibly half that proportion might be sufficient. With 2 per cent., however, no complaint of pain was made. The microbicidal power of protargol was proved clinically also by Alt quite recently in some cases of conjunctivitis caused by the diplo-coccus of Morax-Axenfeld. The microbes were subjugated in from twelve to fifteen days, which, when we consider the superior vitality of all

pathenogenic germs having, as this diplo-coccus has, a capsule surrounding it, is remarkable under the conditions.

Asepsis, however obtained, must always be the same, but the field and factors in eye work are so different and so much more complicated than in general surgery, while the objective is equally important to both the ophthalmic and to the general surgeon, every simplification effort is desirable when compatible with speed and safety. I believe that with protargol we have an efficient as well as safe antiseptic, and one of the quickest in meeting the requirement of ophthalmology.

THE PATHOLOGY OF EXPERIMENTAL QUININE BLINDNESS.

BY WARD A. HOLDEN, A.M., M.D.,
NEW YORK CITY.

(With Three Plates.)

I wish to invite your attention to-day to a brief abstract of the results I have obtained in one of a series of studies projected by Dr. van Gieson and myself, in regard to the pathology of the cerebral stratum of the retina and of the optic nerve, as revealed by the technical methods now used in the study of diseases of the nervous system. The work was done in the Pathological Institute of the New York State Hospitals, and comprised the microscopic examination of the eyes and parts of the brain and cord of eight dogs to which toxic doses of quinine had been given, and which died or were killed at periods of from two hours to seven weeks after the first injection.

Quinine amblyopia was produced experimentally by Brunner and by deBono, who theorized as to its pathology; and the terminal atropy of the nerve which may be the outcome of quinine poisoning has been described by deSchweinitz.* It is the purpose of this investigation to fill the gap left by these experimenters, and to follow the sequence of the pathological processes leading up to the optic-nerve atrophy.

* A full bibliography and abstracts of the important articles on quinine amblyopia can be found in deSchweinitz's "Toxic Ambloypias." Philadelphia. Lea Brothers, 1896.

When a toxic dose of quinine is administered to a dog it becomes blind and deaf in the course of three-quarters of an hour. If the blinded dog is examined with the ophthalmoscope at this time, there will be found a marked pallor of the optic disc, and the vessels of the retina will appear constricted almost to obliteration. A single dose rarely causes permanent blindness, and, as a rule, the retinal veins regain their normal size after a day or two, the arteries may become slightly fuller, and a fair amount of vision returns and is preserved until the dose is repeated.

In passing to the pathology, I shall speak here only of dogs whose eyes were removed immediately after death, and in which, therefore, post-mortem changes and artefacts can be excluded. In the first figure is shown the appearance of the retina of a healthy dog, after being hardened in formol, cut in paraffin, and stained by Nissl's methylen-blue method and eosin. In dogs that died in convulsions two hours after the first injection no marked degenerative changes were found in the retina; but in a dog killed on the third day after three injections had been given, the retinal changes were already well marked. First, a number of ganglion cells exhibited signs of degeneration. (Fig. 3.) A fine vacuolation was observed in some (A), in others the chromophilic granules stained faintly or were absent in part, revealing the cell reticulum, while the nucleus was pushed to the periphery of the cell (B), and here and there the body of a cell was beginning to break down (C and D). In addition to these changes in the ganglion cells, the nerve-fiber layer was spaced out in places, and among the fibers were found round globules, some homogeneous, some granular, taking the eosin stain readily, but not giving the osmic-acid reaction for fat. (M, Fig. 2.) These globules were not the fatty granular cells found in many retinal affections, nor were they cells at all, but resembled the myeline globules that are precipitated by the fixing fluid and follow the breaking down of the rods and cones after death or of the lens fibers in incipient cataract. They are, it would appear in this case, due to the precipitation of any albuminous liquid in the nerve-fiber layer.

On the ninth day the degeneration of the ganglion cells was further advanced and more cells were affected. The Marchi

PLATE I

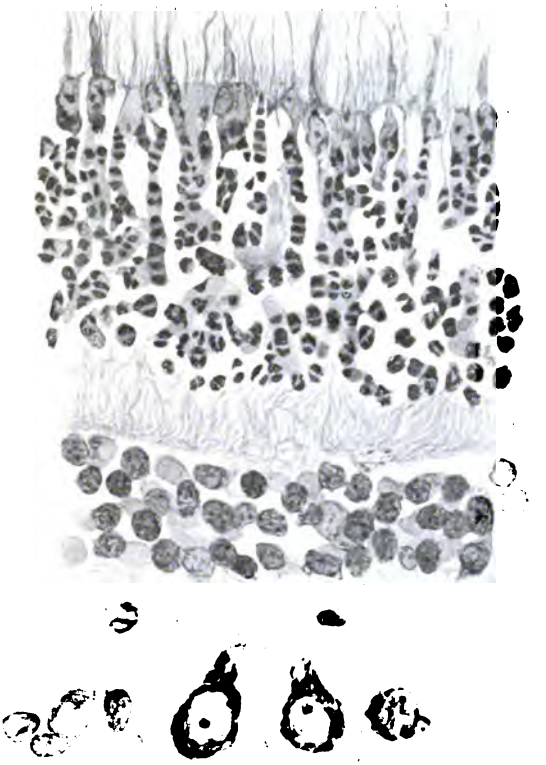


FIG. 1.

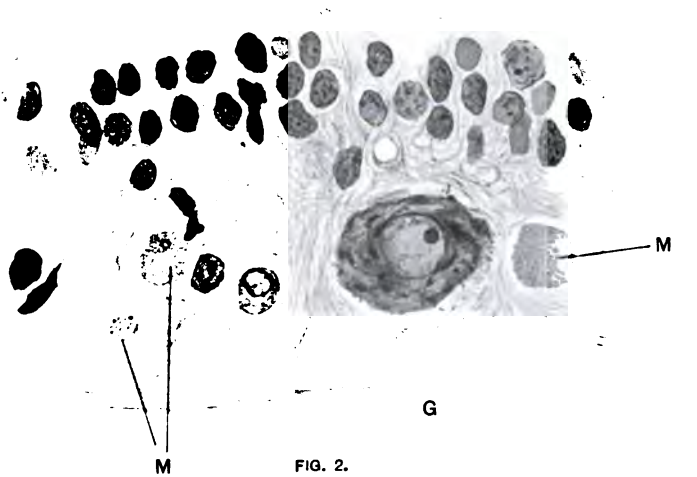


FIG. 2.

VEENFLIET DEL.

osmic-acid staining method, which earliest reveals degenerative changes in the optic nerve, gave at this time negative results.

On the seventeenth day some small groups of fairly normal ganglion cells were found, many cells were in a state of degeneration, and other cells were broken down until only the nucleus remained, while the total number of cells was small, indicating the complete destruction and disappearance of a number. Myelin-like globules were still present in the nerve-fiber layer, being found in greatest number at some distance from the disc. The optic nerves stained by Marchi's method now exhibited a few black dots scattered uniformly through the nerve, indicating a beginning degeneration of the myeline sheaths. (See Fig. 5.)

On the forty-second day, in the retina of a dog to which but two toxic injections had been given, the nerve-fiber layer was largely broken down, and the limitans interna in thin sections was detached here and there; the myeline-like globules, at this time, had almost disappeared. (Fig. 4.) Only a few ganglion cells remained, and most of these were partially broken down, or at least vacuolated. The optic nerve here exhibited an advanced degeneration of the myeline sheaths (Fig. 5) without apparent increase in neuroglia or connective tissue, and this degeneration could be followed up the optic nerve and tract to the ending of the fibers in the external geniculate body and pulvinar of the thalamus. (Fig. 6.) With Nissl's stain the ganglion cells of the external geniculate body, however, were normal in number and appearance. There were no signs of nerve-fiber or ganglion-cell degeneration in the internal geniculate body, to which the auditory fibers run, and which was examined for comparison, nor were degenerative changes found in the fibers of the spinal cord.

Finally, on the forty-sixth day, the destruction of ganglion cells and axis cylinders was found to be still further advanced, and the degeneration of the myeline sheaths of the optic-nerve fibers was more excessive, but the ganglion cells of the external geniculate body still remained normal.

Although the arteries were constricted, no histological changes were noticed in the vessels of the optic nerve or retina, there being neither thickening of the walls nor proliferation of the

endothelium. The very thin-walled central vein of the optic nerve was sometimes found empty and collapsed, and the delicate connective tissue about it, with its small vessels, being then stretched and apparently increased in amount, suggested the appearance of an organized thrombus in the vein, but this same appearance was noted also in healthy dogs when the vein was empty.

The process in quinine amblyopia is one of degeneration of the nerve-fiber and ganglion-cell layers of the retina, due, apparently, to insufficient nourishment because of the constriction of the retinal arteries. This degeneration is followed by an ascending atrophy of the optic-nerve fibers, which extends up to the termination of the nerve-fibers in the external geniculate body and pulvinar of the thalmus. The other layers of the retina apparently do not suffer.

Clinically, it is found that amblyopia does not occur unless the injection of quinine produces marked constriction of the retinal arteries. The retinal changes are analogous to the degenerative changes which follow so-called retinitis of the inner layers. The retinal vessels supply the six inner layers of the retina, the outer layers being nourished by the choroidal vessels. Disorders of the retinal vessels cause degeneration of these inner layers, followed by an ascending atrophy of the optic nerve. This degeneration of the inner layers is seen most clearly after the complete stoppage of retinal circulation by embolism of the central artery, or after long-continued circulatory disturbance in cases of chronic glaucoma. The nerve fibers, ganglion cells, and cells of the inner nuclear layer then all disappear, while the rods and cones, the outer nuclear layer, and the pigment epithelium, making up the outer layers of the retina, remain normal. With reduced, but not abolished, nutritive supply in quinine poisoning, the more delicate elements, that is, those most responsive to nutritive disturbances, namely, the nerve fibers and ganglion cells, in part break down and disappear; while the more resistant, the cells of the inner nuclear layer, are not perceptibly altered. It is questionable how far quinine has any direct toxic influence on the nervous elements in mild cases of poisoning. The amblyopia

PLATE II.

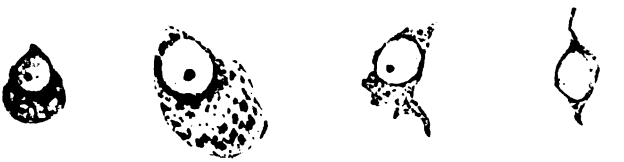


FIG. 3.

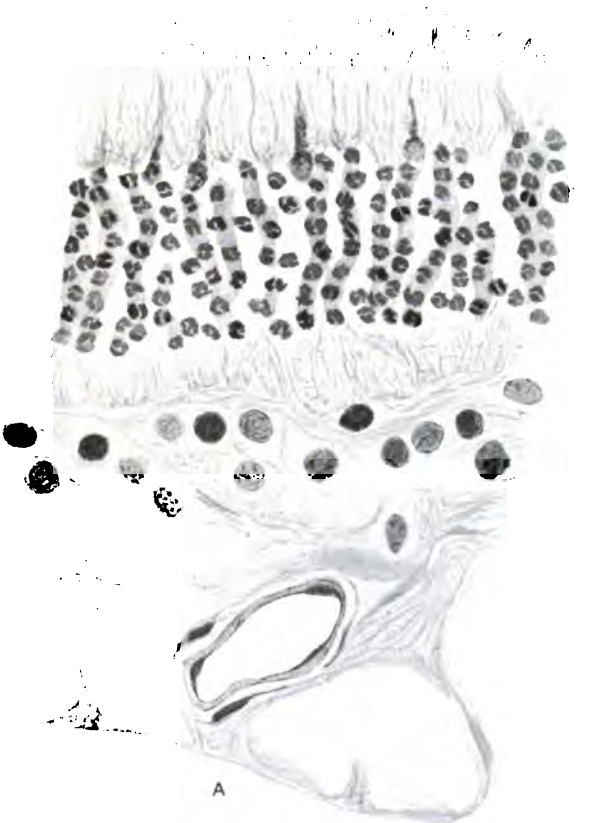


FIG. 4.

BOSSE DEL.

can be explained satisfactorily by the indirect action of quinine in producing spasm of the retinal vessels, and thus diminishing the nutritive supply of the inner layers.

Explanation of the Figures.

Fig. 1. Normal dog's retina. G G, medium-sized ganglion cells. Paraffin. Nissl-eosin stain. Leitz 1/12 i mm. Oc. 2.

Fig. 2. Inner layers of retina three days after toxic injections of quinine. G, a large ganglion cell, fairly normal. M M, myeline-like globules.

Fig. 3. Degenerated ganglion cells from the retina shown in Fig. 2. A, fine vacuolation; B, chromatolysis; C and D, breaking down of cell body.

Fig. 4. Retina in sixth week of quinine poisoning. Absence of ganglion cells. Disorganization of nerve-fibre layer. A, normal artery some distance from the disc.

Fig. 5. A portion of atrophic optic nerve with the medullary sheaths largely broken down into fatty globules (sixth week). Longitudinal section. Celloidin. Marchi osmic-acid stain. Zeiss Obj. A. Oc. 4.

Fig. 6. Corpus genic ext. and pulvinar with atrophic optic tract (T) running over the surface and entering their substance at B. Celloidin. Marchi stain. X 6.

DISCUSSION.

Dr. G. E. deSchweinitz. — The experimental researches of Brunner, Barabaschew, and myself seemed to indicate that the lesion in quinine blindness is peripheral, and that it depends upon an ischaemia of the retinal and optic nerve vessels caused by their contraction under the influence of highly cinchonized blood (E. A. Browne). They further showed that early degeneration of the optic nerve fibrils occurs, later vascular changes (vasculitis, endovasculitis), and finally practical obliteration of the lumen of the vessels and entire atrophy of the nervous elements. According to my individual researches, the pathogenesis appeared to be somewhat as follows: In the earlier stages of the blindness, *i. e.*, from first to fourth week (ophthalmoscopically pallor of discs and great contraction of vessels), the microscope reveals in the optic nerve imperfect differentiation of its fibrous trabeculae and

spreading apart of the individual nerve fibrils, as if the tissue was swollen and oedematous, the fibrils themselves being somewhat beaded and varicose and beginning to degenerate. At this time no changes are present in the vessels. There is no evidence of neuritis. Later, *i. e.*, from two to three months after onset of blindness (ophthalmoscopically white disc and practically complete obliteration of vessels), the microscope reveals marked atrophy of the optic nerve fibrils, which for the most part fail to take the Weigert stain, thickening and collapse of the nutrient arteries of the optic nerve and increase in the size of the perivascular lymph spaces. The atrophy extends throughout the nerve, chiasm, and tracts.

Even in sections of nerves which ophthalmoscopically give every evidence of atrophy, and which, under the microscope, show extensive atrophic changes, certain fibrils still remain unaffected, and singly or in patches stain somewhat imperfectly with the Weigert and Weigert-Pal reagents. This probably explains why vision is sometimes retained even when the degenerative process appears to be complete. It is analogous to the retention of unaffected nerve fibers within the atrophic areas of the papillo-macular degeneration in cases of alcohol and tobacco amblyopia.

In some of my earlier quinine experiments, alterations in the cortex of the visual area of the brain were discovered, *i. e.*, shrinking of the cells and enlargement of the pericellular lymph spaces, but subsequent researches indicated that these lesions were probably due to some error in technique. It is possible that future investigations with the newer histological methods will show that there are really cortical changes under the influence of this poison, exactly as they have been found with other poisons, notably alcohol.

As may be inferred from what I have said, my researches were made when the methods described by Dr. Holden were unknown, and the lesions which he has so beautifully demonstrated could not be discovered by the staining reagents then employed. What I saw may be called *secondary results*, but the *primary effect*, *i. e.*, the effect of the drug upon the ganglion cells, I did not appreciate; indeed, I thought the ganglion cells were unaffected. Dr. Holden has, as he modestly says, filled the gap. He has done much more; he has opened our eyes to a field of research the limits of which are not visible.

With regard to the vascular changes, it may be said they occur late and in association with atrophy. According to Holden,

PLATE III.

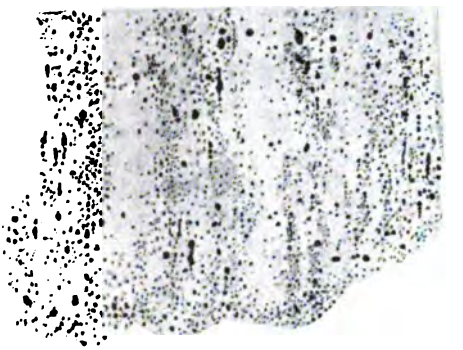


FIG. 5.

FIG. 6.

BOBBE DEL.

it is probable that I mistook for a thrombus an appearance which may be found in the normal dog. The early ischaemia is not yet explained; it is perhaps due, as I have said, to the effect of cinchonized blood on the peripheral circulation.

De Bono, as the result of his researches, reaches entirely different conclusions as regards the pathogenesis of quinine amblyopia. According to him, the eyes of animals poisoned with quinine show only vascular changes in the choroid and changes in the central vessels, but none in the retina and optic nerve. He believes that the ischaemia is not the sole cause of the functional disturbances, inasmuch as the latter may disappear while the ischaemia still remains, and ascribes the visual disturbance to alterations in the percipient elements of the optic nerve, because in frogs poisoned with quinine there is lack of movement in the pigment molecules of the pigment epithelium. It is difficult to understand his failure to observe the atrophy, which can always be produced in the optic nerve by quinine, except on the supposition that his examinations were made in animals before the period of atrophy sets in. I beg once more to express my high appreciation of Dr. Holden's research.

IMPLANTATION OF SPONGE IN THE ORBIT AFTER ENUCLEATION.

By S. D. RISLEY, A.M., M.D.,

PHILADELPHIA, PENN.

The following is a preliminary statement of the results following the implantation of a mass of sponge into the orbit after the enucleation of a shrunken eyeball. A fragment of surgeon's sponge carefully sterilized was pared down to a size just sufficient to fill loosely the cavity left by the removal of the ball, and to permit the suturing of the conjunctiva and subconjunctival tissue over it without undue tension. The sponge was inserted after all hemorrhage had ceased and the blood clots removed, and five black silk sutures deeply placed drew the conjunctiva and the underlying tissues together, entirely concealing it. The design was to furnish a frame-work for the deposition of connective tissue in the orbit, and thus avoid the concave socket which follows

enucleation, and always permits the accumulation of tears and mucus behind the artificial eye. After the operation was completed, the closed lids presented none of the sinking into the orbit usual after excision of the globe, the appearance being much the same as that presented after the insertion of a glass globe in the sclera, as in the Mule's operation.

The eye was dressed as after an ordinary enucleation. The operation was followed by no reaction, pain, or swelling of the lids or tissues in the orbit. There was no discharge and the conjunctiva covering the sponge presented a uniform red appearance. The sutures were removed on the fifth day. On the eighth day the conjunctival wound had opened, leaving a horizontally oval window, into which the sponge mass protruded. There was no pain and no discharge from the conjunctiva, but the surface of the sponge was covered by a homogeneous, yellowish-white, tenacious layer, which could be wiped away in stringy masses. The sponge, on pressure exerted through the lids, exuded from its interstices an abundance of a lymph-like exudate. The lids were closed and a protective bandage re-applied. On the tenth day the sponge mass was still more prominent and was bathed in the exudate. The patient was entirely comfortable, and there was no inflammatory reaction. He was then placed upon the operating table, and the most protuberent part of the sponge shaved off with scissors. When seized with forceps it was found soft and friable, easily breaking down under the grasp of the forceps; indeed, presenting none of the characteristics of the original sponge other than its cell-like structure and color, and the cells were found filled with exudate, which exuded under pressure. After cutting the surface, a slight salmon-colored staining was observed creeping in from the periphery, evidently from severed blood-vessels which were being projected from the surrounding tissues into the sponge mass. It was everywhere firmly adherent to the surrounding tissues and could not have been removed without complete dissection. Two weeks after insertion the sponge presented a uniform homogeneous surface, yellowish white, and tongues of granulation masses were seen

projecting into its surface from the surrounding conjunctiva. The extraocular muscles move the mass freely in all directions.

Three weeks after its insertion the same yellowish white appearance continued, but the entire mass was smaller, and tongues of abundant granulations penetrated it from all sides, which bled freely when punctured. The patient returned to his home at the end of the second week. He has had no discomfort at any time. The final result I shall hope to present in a subsequent communication. This preliminary statement is made not because sponge-grafting is new, but to call the attention of the society to its possible value after enucleation. So far as I know, the first work in this direction was done by Dr. D. H. Hamilton, and his results, with a careful study of the histology, published in a most interesting and elaborate paper in the *Edinburgh Medical Journal* for November, 1881, Vol. XXVII, Part I, and later in the same publication by Norman Porritt. These experimental cases, however, were in general surgical cases. Dr. Belt of Washington was the first, I think, to insert a sponge into the orbit after enucleation, and published five cases in the *Medical News* for June, 1896. He speaks favorably of his results and commends the operation. Dr. A. G. Thomson of Philadelphia reported in the *Medical News*, April 13, 1895, a case of accidental sponge grafting of the conjunctiva. The principal objection to its employment in the orbit is the length of time, two or three months, required to complete the process of absorption of the sponge and its replacement by connective tissue. If the final result shall prove desirable, however, this objection loses much of its force, since the patient has no trouble during this interval, and can be allowed to pursue his ordinary vocation.

DISCUSSION.

Dr. Geo. C. Harlan. — This operation has been performed in several instances recently in France, and one case is reported of a good stump at the end of five months.

ON THE POSITION OF THE EYEBALL DURING THE LISTING ROTATION AS COMPARED ON THE ONE HAND WITH THE SUCCESSIVE POSITIONS OF A VERTICAL PLANE PASSING THROUGH THE RESPECTIVE LINE OF SIGHT, AND ON THE OTHER WITH THE SUCCESSIVE POSITIONS OF THE PLANE OF SIGHT; THESE TWO PLANES CHANGING THEIR POSITIONS IN THE EYEBALL AS THE PARTICULAR LISTING ROTATION PROCEEDS, AND THIS CHANGE EXPLAINING THE APPARENT INCONSISTENCY BETWEEN THE DONDERS INCLINATION AND THE HELMHOLTZ ROTATION.

By G. HAY, M.D.,

BOSTON, MASS.

In the familiar after-image experiment in which the eye in the primary position looks at a vertical line on a wall which is at right angles to the line of sight, and after a few moments, without changing the position of the head, looks up and out, and the after-image appears inclined outward, we have to do with, first, a great circle fixed in the globe, the primary vertical meridian, which, for the sake of simplifying, even if not quite correctly, yet by way of approximation, we may regard as containing the retinal linear image and carrying it from a primary to a secondary position; second, we come into relation with, or we may suppose, another great circle, not fixed in the globe, though always passing vertically through the line of sight, and cutting the wall in a vertical line. The plane of this last circle might be called the secondary vertical plane.

Likewise for the horizontal line on the wall we have to deal with a great circle fixed in the globe, Helmholtz's Netzhauthorizont, and also with a great circle not fixed in the globe, but which passes through the line of sight, and the plane of which cuts the wall referred to in a horizontal line; this plane being the plane of sight.

It is the relations of these great circles to each other which concern us; for it is the relation of the prime vertical meridian to the vertical plane passing through the line of sight which is the basis of the Donders Inclination, and it is the relation of the Netzhauthorizont to the plane of sight which constitutes the Helmholtz rotation.

We have thus presented to our notice three factors: First, certain great circles in a globe; second, their intersections with a plane outside the globe; third, the physiological after-image. For the apparent position of the after-image we must take into account the first two factors, the circles and where they cut the outside plane; but for the question of the rotation of the globe about the line of sight, it is sufficient in the case before us to consider certain great circles in the globe; the consideration of their intersections with a plane outside the globe involves an additional element, the position of the outside plane, and complicates the question; in other words, the consideration of the apparent position of the after-image does not simplify, but rather complicates, the question of the rotation of the globe about the line of sight.

It is proposed to show that the movements with which we are concerned involve, beside the actual rotation of the globe about a fixed (Listing) axis, fixed as to the globe and as to the orbit, also rotations of two specially defined great circles with reference to two other great circles also specially defined, the latter being fixed in the globe, while the former change their position as regards the globe; and accordingly we may speak of the globe as having *relative* rotations as regards these moving great circles. But we do not have a rotation of the globe as a whole about the line of sight.

The Listing rotation makes the line of sight rotate in a plane at right angles to a fixed axis and does not involve any rotation about the line of sight. According to Poinsot's parallelogram of rotations, a rotation cannot be decomposed into two others, the axis of one of which is at right angles to that of the rotation to be decomposed. Moreover, in the case before us, a rotation about the line of sight would be inconsistent with the fixed axis of the

Listing rotation. This inconsistency with conditions resulting from the fixed Listing axis, will be referred to again further on in this paper. Donders, in the Archiv fur Ophthalmologie, 1870, p. 158, says, "Nach dem Listingschen Gesetz, beim Uebergang aus der primären in die secundäre Stellung, gleichgültig welche, von einer wahren Raddrehung des Auges nicht die Rede sein kann."

In the subject before us it may be well to distinguish between certain different movements with which we have to deal. First, we may suppose a globe to rotate about a diameter, fixed as regards the globe and as regards the room in which it is situated, supposing also the great circle arcs in its surface to remain fixed

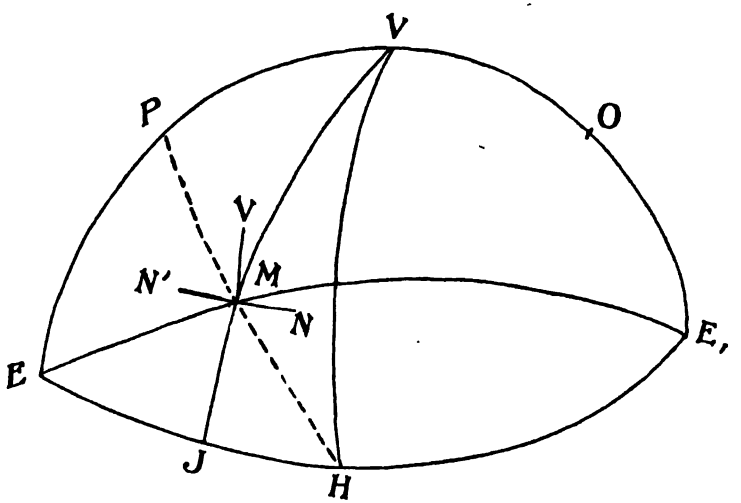


FIG. 2.

as regards the globe, but to be carried along with the surface of the globe; second, we may suppose the same rotation of the globe, but certain of the great circle arcs, besides being carried along simply by the movement of the globe, to have also in addition to this, and while all the time situated in the surface of the globe, a rotation each about one of its diameters.

Let the lines of Fig. 2 represent arcs of great circles of a sphere the center of which is at the center of rotation of the eyeball, and

the surface of which shall approximately represent that of the eyeball. (The center of the sphere is not represented in the diagram.) The eye, the right, may be supposed to be looking, with the head erect, horizontally and directly forward; a position which is here assumed to be the primary position.

Let H represent the intersection of the line of sight with the cornea; that is, nearly the middle of the cornea.

Let H be a pole of the great circle $EVE_{,}$, so that

$HE = HE_{,} = HO = HV = HP = 90°$.

If we take V to be the middle of the semi-circular arc $EVE_{,}$ then

$VE = VE_{,} = VH = 90°$. and V is a pole of great circle $EHE_{,}$.

The diameter $EE_{,}$ is supposed horizontal and to pass through the centers of rotation of the two eyes.

If now the plane of $EHE_{,}$ is horizontal, the plane of HV is vertical, and HV will represent a vertical great circle passing through the primary line of sight, and is called the primary vertical meridian. Its plane is regarded as fixed with reference to the globe.

Likewise $EHE_{,}$ which is perpendicular at H to HV, is conceived as a fixed line as regards the surface of the globe, and its plane is what Helmholtz calls the Netzhauthorizont. With regard to this last plane it may, by way of anticipation, be stated that it is the angle between it and the plane of sight (the plane of the lines of sight of the two eyes) that Helmholtz calls the angle of rotation of the eye about the line of sight. (See Physiolog. Optik, 2d Edition, p. 618.)

These two planes, that of the primary vertical meridian and that of the Netzhauthorizont, being conceived as fixed with reference to the sphere do not change their mutual inclination however the eye may be moved.

This leads to the consideration of two other planes or great circles which are not fixed in the globe, and in reference to which the Netzhauthorizont and the primary vertical plane have *relative* rotations. These planes are the plane of sight $EME_{,}$ and the vertical plane VMJ passing through the line of sight. This last might be called for brevity the secondary vertical plane.

To help us to see the relations of position of the above-mentioned planes or great circles during the Listing rotation, suppose a rotation of the globe about its diameter passing through O. Let this diameter be fixed in the globe and in the orbit, and the latter be fixed with reference to the room occupied.

Let O be the pole of great circle arc HP. The great circle HP is fixed in the globe, and during the supposed rotation coincides with a plane perpendicular to the fixed axis and fixed in the room occupied; H will move in the latter fixed plane and in an arc coinciding with the great circle arc HP. Suppose H to move to M by the rotation mentioned.

To facilitate the conception of this change of position, we may suppose duplicate stationary arcs coinciding with those of the diagram. The letter V may then designate a fixed point of the duplicate stationary arc, with which point as the Listing rotation proceeds, different points of the moving surface will successively coincide. Likewise as regards the letters E, and P, and other letters as convenient.

We have thus to consider during the Listing rotation certain stationary duplicate great circles; also certain great circles fixed in the globe, but carried along by the rotation, one of them HP, being also fixed relatively to the room occupied; finally, certain great circles considered as moving in the globe in such a way as to conform to certain definitions.

Let Mv represent the place of the primary vertical meridian after H is moved to M, let MN represent the Netzhauthorizont after H is moved to M. These two arcs make an angle of 90° with each other, as they did when M was at H, or as in the primary position of the eye.

Let E and E, be points of the surface of the globe through which passes the straight line connecting the centers of rotation of the two eyes, this line being horizontal and the centers of rotation being stationary. Also the points E and E, considered as points of the surface, are different for different stages of the Listing rotation. EME, convex toward the reader, is in the plane of sight for the position of the line of sight (of the right eye), passing through M. Great circle VMJ is in a vertical plane passing

through the line of sight. It is to be noticed that the letter V, though indicating a fixed point on the duplicate stationary arc EV E, indicates different points on the surface for different stages of the Listing rotation.

The arc VMJ changes its position in space for a movement of M along HP by rotation of the globe about the diameter through O; also changes its position on the surface of the globe, rotating around the moving point M, and away from MP.

Likewise the arc EM changes its position in space as M moves along arc HP, and also changes its position on the surface, rotating around the moving point M, and away from MP.

The relations of this paragraph and of the preceding may be seen on a globe by pasting narrow strips of paper on the surface so as to represent the arcs ME and MV for a certain position of M.

Each of these arcs Me and MV makes a greater angle with MP as M moves toward P, and therefore angle EMV becomes larger, or angle VME, becomes smaller as M moves toward P.

To show on the diagram that the ang. PMV becomes larger as M moves toward P, consider the spherical triangle PMV, which is right-angled at P. We have by spherical trigonometry,

$$\text{tang. VMP} = \frac{\text{tang. PV}}{\text{sin. PM,}}$$

from which appears that as PM is smaller, ang. PMV is larger.

Likewise for the angle PME.

As EM and VJ are rotating with reference to eath other about the moving M, we cannot infer from the relation of the prime vertical meridian to VJ what its relation is to EM, until we know how EM is rotating with reference to VJ. Or because the prime vertical meridian for line of sight through M tilts out at its upper part from VJ that does not tell us what angle it makes with EME,.

Now EM is rotated in such a way that the prime vertical meridian, when the line of sight passes through M, makes an acute angle with ME,, the angle opening toward the reader's right or toward a supposed patient's left, and the arc of the Netzhauthorizont passes from M to the reader's right and below the

arc EME_1, and this relation is in accordance with Helmholtz's statement.

That there is a relative rotation in the direction stated by Helmholtz may, for a position of the axis of the Listing rotation similar to that indicated in the diagram, be shown on a globe, with assistance of some narrow strips of brass tape, which may serve as subsidiary great circle arcs. Also it is shown for an inclination of the axis of 45° to the vertical in a communication published in the TRANSACTIONS OF THE AM. OPHTH. SOCIETY for 1868, and in general for any position of the Listing axis, both the Donders inclination and the Helmholtz rotation may be shown as follows:

If on the diagram we consider the spherical triangle VMP, which is right-angled at P, we have

$$\text{tang. VMP} = \frac{\text{tang. VP}}{\text{sin. MP}}, \text{ or}$$

$$\text{tang. VMP} > \text{tang. VP}.$$

Now PV is the measure of the angle PHV, and in the movements of the particular Listing rotation, the angle VHP, regarded as the angle between the primary vertical meridian and HP, both of which are fixed in the globe, remains constant and is equal to the angle vMP. Therefore angle VMP > ang. vMP.

The corresponding relation of the two arcs Mv and MV is the essential basis of the Donders Inclination, as the plane of MV is vertical.

Likewise, we shall find that the ang. EMP is greater than the ang. N'MP, and this shows that the arcs MN and ME_1 are related to each other, as they should be in order to conform to Helmholtz's statement as to the direction of his (relative) rotation.

These two conditions will appear consistent if we consider that ang. vMN = 90° = constant, while ang. VME_1, which in the primary position of the eye was a right angle, is now acute, having become smaller as H moves toward P.

We have thus seen that there is a *relative* rotation of the Netzhauthorizont about the line of sight with respect to the moving plane of sight, and in the direction stated by Helmholtz. But,

on the other hand, it appears from the preceding considerations that there is also a *relative* rotation of the prime vertical meridian plane about the line of sight, and with reference to the moving vertical plane VMJ in the direction toward the reader's left, the opposite of that of the preceding relative rotation, as the ang. vMV becomes greater as M moves toward P, ang. vMP being constant and ang. PMV becoming greater as M moves toward P. These two *relative* rotations, though at first they might appear inconsistent, yet co-exist and are explained by the angular relations mentioned above, which make it apparent that, in comparison with the respective positions for the primary position of the eye, the prime vertical meridian Mv is relatively rotated to the reader's left with regard to the moving arc MV, but to the reader's right with regard to the moving arc ME,.

The case might be stated as follows:

The Donders proposition is based on the comparison of the relative positions of the prime vertical meridian and the secondary vertical plane in a secondary position of the eye as compared with their relative positions in the primary position of the eye; and this comparison shows a *relative* rotation of the globe to the right.

The Helmholtz proposition is based on the comparison of the relative positions of the Netzhauthorizont and the plane of sight in a secondary position of the eye as compared with their relative positions in the primary position of the eye; and this comparison shows a *relative* rotation of the globe to the left.

Now, bearing in mind that there is no real rotation about the line of sight during a Listing rotation proper, these *relative* rotations in opposite directions simply mean real rotations of moving arcs or great circles in opposite directions; that is, the secondary vertical plane is moving away from the prime vertical meridian and the plane of sight is moving toward the prime vertical meridian, or the plane of sight is moving away from the Netzhauthorizont, and the secondary vertical plane is moving toward it, so that the primary vertical meridian has *relative* rotations in different directions according as we compare its position with that of the secondary vertical plane or with that of the plane of sight.

The angles which the great circles referred to make with each other are not the same as those of their intersections with the plane perpendicular to the primary line of sight, or as it might be called, for brevity, the plane of projection. For instance, the plane of HP is fixed in the globe and coincides with a plane fixed in the orbit. But the successive secondary vertical planes, though changing their inclination with this fixed plane coinciding with the plane HP, yet all are represented on the plane of projection by vertical lines; also, the successive planes of sight, though changing their inclination to the same fixed plane, are all represented by horizontal lines on the plane of projection. Moreover, the two great circles fixed in the globe, that of the prime vertical meridian and the Netzhauthorizont are represented on the plane of projection by oblique lines, this suggesting rotations of the globe, but apparently inconsistent with each other, relatively to two fixed directions, those of horizontal and vertical lines, which latter, however, really represent planes not fixed but rotating. Thus the appearances on the plane of projection do not of themselves, without proper interpretations, show the real conditions of the arcs on the globe. They depend not simply on positions of the great circles, but also upon location of the plane of projection, a plane outside the globe.

If we undertake to decide the question of rotation about the line of sight by referring to the after-images on the plane perpendicular to the primary line of sight, the answer is ambiguous, not decisive.

If we should undertake to decide it by comparing the positions of those portions of the arcs passing through M, which are near to M, with the positions of the corresponding portions passing through H, we may refer the positions of both of these sets to that of the plane HP, which is fixed in the globe and in the orbit. If there were a rotation about the line of sight, then the arc Mv, which is fixed in the globe, would change its angle with the fixed plane HP. But this it does not do, as both Mv and HP are fixed on the surface of the globe. Or, we might say, the plane HP is fixed in the orbit; or coincides with a plane which is fixed in the orbit so that we cannot suppose it to rotate about the line of sight.

Therefore, in the case before us, there is no rotation of the globe about the line of sight.

The inclination of the prime vertical meridian outward, as shown by the apparent position of the after-image in the familiar experiment, may be explained, without supposing a rotation of the globe as a whole about the line of sight, by the relative positions of the prime vertical meridian and the secondary vertical plane in the globe, the former having a relative rotation outward with reference to the latter, and by the fact that the latter cuts the plane of projection in a vertical line.

Suppose when the eye is in a primary position, a linear image is received at the macula, where the primary vertical meridian intersects the retina, and that the eye is then moved upward and outward by a Listing rotation. Assuming that the after-image is mentally projected outward and along the line of sight and located where the primary vertical plane intersects the plane of projection, it would be inclined at its upper part outward, as it actually appears.

CASSARIPE: A NEW REMEDY FOR THE TREATMENT OF CORNEAL ULCERS AND OTHER INFECTIOUS DISEASES OF THE EYE.

BY S. D. RISLEY, A.M., M.D.

Through the courtesy of Dr. H. B. Chandler of Boston, my attention was called to "*Cassaripe*," in a conversation at Washington last year during the meeting of this society. He subsequently sent to me a supply of the preparation, a 10 per cent. ointment, which I have used with most gratifying results in a large series of cases of ulcers of the cornea, and a large group of cases of purulent disease of the conjunctiva. The following letter from Dr. Chandler gives the information he had gained about the drug, and explains his reasons for its employment. To him belongs the credit for calling attention to what promises to be a useful addition to our means of treating those dangerous and often rebellious forms of disease.

After employing the drug as noted above and recognizing its value, I wrote to Dr. Chandler for further information about it, as I could find no satisfactory account of it except a mere mention of the name *cassareep* or *cassaripe* in the Century Dictionary, as the juice of the Black Cassava. In reply, Dr. Chandler wrote me the following letter:

"DEAR DOCTOR:

"In reply to yours regarding cassaripe, I would say that it is obtained from the bitter cassava plant. The natives in making cassava bread, grate the root, and a milky juice exudes; this is acid, and is supposed to be very poisonous. The juice is concentrated to a semi-solid known as cassaripe, heat destroying its poisonous qualities. Its use, by me, was suggested while in the tropics, by learning that it was used commonly as a preservative: a solution poured over meat seems to preserve it indefinitely. Theodore Metcalf & Co. imported some for me two or three years ago, as none could be found in this country. In using it I often incorporate atropin or pilocarpin, with happy results. In large sloughing corneal ulcers, in old persons, it has given more satisfaction to me than anything I have ever used. I have written nothing regarding it."

Later, in conversation with my friend, Dr. J. T. Rothrock, Commissioner of Forestry for Pennsylvania, he kindly consented to look up the matter from the standpoint of its botany. I am indebted to him for the following facts: *Cassareep* is the inspissated juice of the cassava, which is highly antiseptic and forms the basis of the West India pepper pot. The cassava belongs to the Euphorbiaceae or Spurge family, and is extensively cultivated in tropical America and the West Indies for the large fleshy root, which contains an abundance of farina. Two principal varieties are cultivated, the Manioc, or *Manihot utilitissima*, or bitter cassava, and the *Manihot aipi*, or sweet cassava. The former contains a juice of highly poisonous nature, while the latter is wholesome and used as a vegetable. While they both produce a large quantity of farina, the Utilitissima is more productive, and is, therefore, more extensively cultivated. The farina is obtained by grating the root to a pulp, after which the poisonous juice is expelled by pressure and washing. The mass is then pounded into a coarse meal resembling bread-crumbs, which are made into

cakes and subjected to heat, which drives off or destroys what may remain of the poisonous juice. This forms the cassava bread, which is an important article of food throughout tropical America.

There seems to be not a little confusion regarding the botanical features of different species of the Euphorbiaceae, which contains many poisonous varieties, even the natives often mistaking the poisonous for the innocent species in preparing their food.

The Genus Manihot is shrubby or herbaceous, or shrubby below and herbaceous above. Male and female flowers are distinct, though on the same plant. The seed vessels are three-celled and three-seeded. Petals none, but the calyx of the male flowers are often colored. The flowers are in racemes, each one under a bract. Muller, in DeCandolles Prod., Vol. 15, Part 2, page 1062, considers Manihot aipi, or sweet Manihot, as merely a variety of Manihot palmata, and says that the leaves are usually five, parted with the lobes obovate lanceolate or elliptical lanceolate, and more or less covered with a *whitish* bloom on the lower surface. He adds that this species differs from the Manihot utilitissima or bitter Manihot, the poisonous species, not only in the reddish non-poisonous root, but also in its ovaries, capsules, and stipules; also that the leaves of the utilitissima are deeply palmated, three to five parted divisions about ten to fifteen centimeters long and one to five broad, covered with *glaucous* bloom beneath and brownish above.

But Griseback, in his "Flora of the British West India Islands," page 37, regards the forms above mentioned as belonging to the same species, and adds that the tubers, both sweet and bitter, are found, but this difference is not accompanied with trustworthy specific characters. Dr. Rothrock agrees with this statement, and adds "that the plants are so much alike that even in the tropics deaths occur from eating the wrong plant by mistake." He himself witnessed a death from this cause in 1890, while at Governor's Harbor, Island of Eleuthera, one of the Bahamas. Lindley, in his "Vegetable Kingdom," page 280, says: "M. utilitissima is a shrub about eight feet high, cultivated for food all over the tropical parts of the world. Of this

plant, the large root, weighing as much as thirty pounds, is full of a venomous juice, which if taken internally produces death." An intoxicating beverage is made from it called Piwarrie, which is prepared by women chewing the cassava cakes, and ejecting the masticated substance into a wooden bowl, where it is allowed to ferment for some days, and then boiled. It is a common drink with the natives, and is said to have an agreeable taste; the mode of preparation, however, is repugnant to Europeans, notwithstanding this one who used it reports thus, "In my opinion, it is very agreeable and wholesome, for I drank it in large quantities at the different Indian settlements I visited."

In preparing the cassava as above stated, the poisonous expressed juice is put into water, the starch which it contains falls to the bottom, the water is poured off and the starch placed on hot plates; this causes the starch grains to swell and burst, forming the tapioca or Brazilian arrowroot of the shops. It is this poisonous juice or waste product from which the cassaripe is prepared, its poisonous properties being destroyed by the heat employed in its preparation. The coolies, in preparing the cassaripe used for cooking purposes, especially in preparing meat, mix red pepper and spices with the cassava juice, which they boil to the thickness of syrup. It is then cooled, bottled, and a quantity exported. It is this cassaripe which makes the renowned West India pepper pot. One teaspoonful of it put into a vessel containing a number of pounds of mixed meats and boiled will preserve the meat for an indefinite time, notwithstanding the perpetual summer of those tropical climes.

A few points in its employment need to be emphasized. I have at no time used it stronger than a 10 per cent. ointment. It causes no irritation, however, and I see no objection to employing it in much stronger preparations. The ointment was applied freely between the lids, and the eye subjected to massage so as to distribute it thoroughly into the retrotarsal folds; and in the corneal cases, a protecting bandage applied. When the patients were in the hospital, this was repeated three times daily. In the outdoor cases, morning and evening. No other treatment was employed except atropia, and a wash of boracic acid. In a

few minutes after the application of the ointment in new cases, the discomfort was much diminished, and the improvement was usually rapid as compared to other modes of treatment. In a case of ophthalmia neonatorum, the eye was thoroughly cleansed, the ointment of cassaripe applied, and a supply given to be used three times daily at home, after the usual wash. In two days the purulent discharge had entirely ceased. My observations seem to show the cassaripe to be a powerful vegetable antiseptic, which promises to be a useful addition to our means of treating infectious forms of eye disease.

DISCUSSION.

DR. JOHN GREEN. — About forty years ago it was my good fortune to visit Surinam in the company of the late Professor Jeffries Wyman of Cambridge. I observed there the mode of preparation of the cassava plant, including the expression of the juice from the freshly grated roots, and the making of cassava bread. In most cases the juice was thrown away, but occasionally it was saved and concentrated by boiling to a dark-colored fluid extract, resembling mushroom catsup, to be used as a condiment. It was there known as *cassaripo*, and it was said to have the property of preserving meat from becoming tainted. The poison in the fresh root seems to be dissipated by heat, as well in the baking of the bread as in the boiling of the juice. The odor of the fresh juice recalled that of the bitter almond; it has been stated that the presence of hydrocyanic acid has been demonstrated by chemical analysis.

DR. MYLES STANDISH. — This ointment of cassaripe which Dr. Chandler originally introduced has been in use four or five years at the Massachusetts Charitable Eye and Ear Infirmary by some of the men. It is my habit in ordering it to give to the patients directions to use it three or four times a day, usually insisting that they use it at night before going to bed. Sufficient of it then remains in the sac during the night to leave some of the brownish-like mass along the edge of the lids in the morning. There has been no complaint in its use, and in my experience it has proven a useful drug.

The most serious objection to the preparation is that it is not always reliable, for while one series of cases will do well, other cases, having apparently the same conditions, are not improved by it. When it was first used, Dr. Chandler thought that it had

the property of leaving a less dense scar after corneal ulcerations. I have not heard Dr. Chandler advocating it very strongly on that account of late, and perhaps he has given up that idea. I have thought and believe at present that if the ointment be used for some time after the healing has occurred, the scar is less dense than if treated by other means. Of course, it is difficult to estimate how dense a scar will be in a given case, but if I personally had an ulcer of the cornea at the present time I should treat it with cassaripe for a considerable length of time after the ulcer had apparently healed.

DR. E. E. JACK. — I am rather surprised that neither Dr. Risley nor Dr. Standish have seen any irritation from the use of cassaripe. So far as I know, I have used the same strength of preparation, but I remember one or two cases distinctly where it produced a great deal of discomfort.

DR. STANDISH. — Almost any application to the eye will be very bitterly complained of by some patients, but I think the rule is that it is only an occasional patient that complains of this.

DR. RISLEY. — That the opacity of the cornea following repair in corneal ulcers may be lessened by use of this preparation is possible, but I do not think I have ever noticed the slightest difference in that respect as compared to other modes of treatment. I am sure that the amount of opacity remaining must depend largely upon the destruction of corneal tissue by the disease.

I have not found a case in which there was the slightest irritation produced by the drug, but, on the other hand, the comfort which follows its use is very striking. The preparation I have used has usually been made up with cosmoline or white vaseline.

CASE OF SYMPATHETIC INFLAMMATION FROM ADHESION OF EYELID TO STUMP — RECOVERY.

BY T. Y. SUTPHEN, M.D.,

NEWARK, N. J.

On July 4, 1893, I was called by Dr. Underwood of Newark to see Thomas G., a boy nine years of age, who had been injured in the left eye, two hours before, by the explosion of a blank cartridge. A large piece of the shell had gone completely through the upper eyelid and had made an extensive and ragged wound

in the globe, involving the iris, lens, and ciliary body. The piece of metal had already been removed by the doctor, and the wound in the lid, after cleansing, was closed by sutures. The boy had had some malarial trouble just previous to the accident, and the enucleation, which seemed imperative, was deferred for a little to allow the patient to improve in a general way. There was no unusual inflammation following the injury, the boy being kept in bed and cold compresses made locally. On July 21st the injured eye, being more or less irritable, and hopelessly blind, was removed under ether. The right eye at that time was entirely free from any irritation, vision was normal, and ophthalmoscopic examination negative. Recovery from the operation was quick and satisfactory and the care of the case was left to the family physician. Nothing wrong appeared until the morning of August 4th, fourteen days after the enucleation, when I was again called to see the boy because the right eye had been found red and irritable. There was considerable pericorneal injection with photophobia and lachrymation, but apparently no iritis. A solution of the sulphate of atropia was ordered locally, and small doses of calomel given internally. On August 6th the inflammatory symptoms had entirely disappeared, and the pupil was widely dilated, but there was some distention of the retinal veins. Still this latter appearance was hardly sufficient to convince me that a neuritis was developing. The amount of vision was not determined, the boy appearing to see as usual. There was a watery and reddened condition of the lids of the left side, where the eye had been removed. August 11th, the right eye appeared well, no ophthalmoscopic examination was made. On August 12th, was called again, as the inflammation had returned in the right eye with vigor. Quinine was ordered. On August 14th, the eye was again quite free from inflammation, but two or three slight synechia were seen at the upper pupillary margin, and the ophthalmoscope disclosed a well-marked neuritis. Vision had dropped down to the ability to count fingers at six feet only. It was then determined to amputate the stump, and this was undertaken the following day. Upon endeavoring to raise the upper lid, I was surprised to find

strong bands of adhesion between conjunctival surface of the scar in the eyelid and the nerve stump, preventing any freedom of motion of the lid and causing traction upon the nerve with every act of winking. This revealed to my mind the source of the sympathetic inflammation. These bands were severed close to the nerve and the operative procedure ended there. The boy was treated as before, the mydriatic continued, and the mercurial pushed. Within a day or two improvement was noticed, vision rapidly gained, and a steady subsidence of the neuritis was followed by perfect vision, which has remained until the present time.

This case is important, inasmuch as it strongly goes to prove that irritation of the nerve may be a cause of sympathetic inflammation in the fellow eye.

TWO CASES OF PREMATURE DELIVERY TO PRESERVE SIGHT.

BY A. E. ADAMS, M.D.,
NEWBURGH, N. Y.

Mrs. ————, aged 23, a primipara, pregnant seven months, consulted me April 17, 1895.

Her mother died of Bright's disease.

She said she had no headache worth mentioning, and no swelling of the feet or limbs. The only symptom complained of was a gradual but rapid failure of sight for the past two weeks. Her physician had, in a routine way, examined the urine and told her he found no albumen in it.

The R. V. was 4/200 and L. V. 3/200. There was a neuroretinitis in each eye, and the nerve heads were badly swollen (3.50 to 4 D.). The veins were full and tortuous. There were a few glistening white spots in the region of the maculae, and several large plaques in other portions of the fundi; no hemorrhages.

I wrote a letter to the family physician stating the condition of the eyes, and that there was no question in my mind about the cause of the trouble, even if no albumen had been found in the urine on one previous examination.

As this case resided in an adjoining county, I did not see her

again until April 22d, when I found the optic neuritis more marked, the retinitis about the same, and several small fan-shaped hemorrhages. The sight had failed perceptibly. The R. V. was 3/200 and L. V. 1/200. Dr. Gordon, who had seen the case since my previous examination, reported that he had found albumen and casts in the urine.

After due consideration of the condition of the nerves, the character of the exudation, the appearance of hemorrhages, the probable viability of the child, and the rapid onset of the trouble, I advised premature delivery if there was any more failure of vision.

On April 27th I received a letter from the patient's sister. She wrote:

"My sister is now (fifty-two hours after the birth of her baby) sleeping peacefully, and has been most comfortable all those hours. She could not distinguish anything but light from dark, but this morning there was a marked change and she could tell baby's eyes were open."

On May 29th I found the R. V. 10/200 and L. V. 20/50. In the right eye there were large plaques of exudation near the macula, and in the left eye a few patches between the macula and disc; also some small glistening white spots around the macula.

One year later, May 25, 1896, vision was 20/30 in each eye; no improvement with glasses. There was concentric contraction of the fields, the right disc was more pale than the left; otherwise, the fundus appeared normal.

May 10, 1898 (three years after delivery), her physician informs me that she has considerable albumen in the urine. The vision, he thinks, remains the same.

Mrs. ————, aged 27, a primipara, pregnant six and a half months, consulted me March 19, 1897.

Family history good. The patient has been a great sufferer from rheumatism; feet swell at times, and at present are more swollen than usual, although she has no pain in them. No oedema of the eyelids, and no headache. She gave a history of sudden failure of sight, that was first noticed while in church.

On examination I found the R. V. 20/200 and L. V. 6/200. A neuro-retinitis with large yellow-white patches of exudation in each retina. Hemorrhages in the retina were numerous, of dark color, and irregular shape. The urine was loaded with albumen.

March 23d I saw the patient at her home.

With the R. E. she counted fingers imperfectly at 6 feet, and with the L. E. at two feet. The retinitis and hemorrhages had increased. The apparent rapid increase of the exudation and degeneration in the coats of the blood-vessels decided my course in this case, and I advised the induction of labor at once.

March 25th. The family physician, Dr. J. T. Howell, reported the R. V. perception of large objects, and the L. V. perception of light only. Premature delivery of a dead foetus was accomplished early in the day; uraemic convulsions commenced soon after delivery and continued about two hours, and for twenty-four hours her condition was critical. Her recovery was slow.

One month after delivery (April 24th) I found the R. V. 10/200 and L. V. perception of large objects. In the right fundus there were some small glistening white spots and some pigment, and in the left fundus a large amount of exudation and hemorrhages in and around the macula. The patient was very weak and despondent, and said she would much rather die than live with sight like this.

May 8th. R. V. 10/100, L. V. 1/200.

May 22d. R. V. 20/70, L. V. 1/200.

June 23d. R. V. 20/30, L. V. 8/200.

Aug. 2d. R. V. 20/20, L. V. 8/200.

May 28th, 1898 (one year after delivery), I found the R. V. 20/20 and L. V. 12/200. The right disc was very pale, and the left disc almost white; there were a few scattered deposits of pigment in the right fundus and a large amount in the left macular region.

Up to this time she had not been free from albuminuria, and on two occasions during the past year her physician tells me she has had a considerable quantity of albumen in the urine.

We have all seen pregnant women who had defective sight

due to an affection of the kidneys during pregnancy, carry the child to full term, and eventually recover perfect vision; in other cases complicated by chronic Bright's disease, sight is permanently impaired or lost by one or repeated pregnancies.

In my first case the optic neuritis and retinitis, especially the optic neuritis, was the prominent feature, while in the second case the retinitis and hemorrhages, especially the latter, was most noticeable. In the first case I considered the few superficial fan-shaped hemorrhages had but little significance; it is my opinion that if the optic neuritis had continued or increased for nearly two months longer the woman would eventually have been almost or totally blind from the resulting atrophy.

In the second case a hemorrhage in the region of the macula undoubtedly caused the sudden failure of sight; the vision in one eye was probably very poor, but had not been noticed until a hemorrhage occurred in the other eye.

If abortion is ever justifiable, it is in these cases of chronic Bright's disease where there is a neuro-retinitis with hemorrhages, and almost total loss of sight probable, especially as the uraemic condition of the blood is dangerous to the life of the foetus, and a constant menace to the life of the mother.

In a recent report (1897) of 10,233 cases published by the Society of the Lying-in Hospital of the City of New York, there were 42 fatal cases following delivery, and 12 of these were albuminuric. Six of the 12 had eclampsia. It also gives a total of 10 induced labors; of these three were albuminuric, with no death of mother or child.

There was no case of premature delivery to preserve sight, and no record of impaired vision.

My attempts to obtain statistics from the large lying-in hospitals, of the frequency of impaired vision and premature delivery to preserve sight, have not been satisfactory.

It appears to me desirable that this subject should receive more attention.

Retinal changes occur in from 20 to 33 per cent. of all cases of Bright's disease.[1] About two-thirds of these cases of neuro-

[1] Noyes — Diseases of the Eye.

retinitis complain of some disturbance of vision, while the other one-third give no such indication of this serious condition,[2] and every practitioner must admit that serious eye complications occasionally exist when no albumen can be discovered in the urine. I reiterate what Dr. Noyes has written, ". . . . inspection with the ophthalmoscope is strongly recommended for the same prudential reasons which call for examination of the urine even though there are no urgent symptoms."[1]

Of twenty-two cases reported by Silex,[3] eleven recovered vision more than 1/6. Ten others remained with a lesser degree of acuity, and five of them were almost blind; one had double detachment of the retinae.

Finally, in considering the sacrifice of the foetus to preserve sight, we must take into account the expectancy of life if the child should be born alive and the mother become blind. One-tenth of all the children born die before the first month has been completed,[4] and less than two-thirds live to be five years of age.[5]

For the mothers with defective or total loss of sight for the remainder of their lives, we find, for example, in my cases, the first would have, if healthy, an expectancy of 39½ years, and the second 36½ years.

UNILATERAL WINKING AS A TEST OF COMPARATIVE VISUAL ACUITY.

By WHEELOCK RIDER, M.D.,

ROCHESTER, N. Y.

Ten years ago I read before a local medical society a paper in which I showed, so far as the limited material at hand permitted, that a relation exists between the absolute and relative vision of an individual's two eyes and his power of voluntarily closing one independently of the other. The collection and recording of observations was continued, and in 1890 a collabo-

[2] Loring — Tran's Am. Oph. Soc., 1882.
[3] Annals D'Oculistique, Feb. 1895.
[4] Smith — Diseases of Children.
[5] Mortality Reports, N. Y. State (8 years).

rated paper entitled "The Winking Test," based upon a larger number of cases, was read before this society by Dr. Charles E. Rider.

Since this relation of the winking facility to the relative visual acuity or static refractive condition was first called to my attention, I have endeavored to find some evidence in scientific and medical literature of its having been observed by others, but without success. The only reference that has been brought to my attention is, strangely enough, in a minor poem by Bret Harte, "A Tale of a Pony"—

> "Bean pods are noisiest when dry,
> And you always wink with your weakest eye."

In a personal communication, Mr. Harte informs me that the genesis of this line is not clear to him, but that he is certain that it was not from observation and was not based upon the sayings of others. He ascribes it to a "hurried and youthful generalization," and disclaims intention or thought of uttering physiological truth.

Inasmuch as the closing of one eye is a lid function, and the result of this very common maneuver is monocular vision, it will be instructive, before considering in detail the observations which show the relation between facility of winking* and vision, to glance at the statements concerning monocular and binocular vision and the lid functions as given in ophthalmological treatises and works on the physiology of the special senses. In these one searches in vain for any explicit statement of the two following facts: First, that monocular vision is of any advantage to one who is capable of normal binocular vision; second and consequently, that the closing of one eye to secure these advantages of monocular vision is a normal function of the lids. We find, as a rule, binocular vision exhaustively treated, monocular vision being mentioned only to point out its disadvantages, *i. e.*, its flat and limited field. Indeed, one recent writer speaks of binocular vision as being unqualifiedly "more effective," thus emphasizing by positive statement what seems implied by the silence of others

*Throughout this paper the term "wink," unless otherwise explicitly stated, will denote the closing of one eye alone, a distinction necessary to avoid unpleasant circumlocution, since there is no distinctive term in the English language.

that there is a general failure to recognize the peculiar and decided value of monocular vision in certain of the activities of civilized life. In another place I shall enumerate in some detail the advantages peculiar to the vision of a single eye.

The transition from binocular to monocular vision is effected in one of two ways, either by the suppression of one image in the visual center or by winking. Suppression in the center is found chiefly in instances where defective vision of long standing, or other permanent abnormalities, as, for instance, such as would cause diplopia, are found. It is seldom resorted to voluntarily; in fact, relatively few individuals with normal vision have acquired the trick of voluntary suppression.

Suppression of the image by voluntary lid closure is, however, in daily and even hourly use by many, as a means of securing monocular vision when only occasional use is to be made of one eye.

It is to this unilateral closure as a normal lid function that I wish to call attention. The commonly enumerated functions of the lids are protection of the eye from mechanical injury, and from excessive light during waking hours and all light during sleep, the moistening and cleansing of the eyeball with mucus and tears, the removal of foreign matter, and assistance to the escape of tears. It has been stated that the lids exercise an influence upon intraocular circulation and that the tears are expressed from the lachrymal glands by their forcible contraction. Even the frequent use of the lids alone or in association with other parts of the face as a means of expression of emotions has received detailed attention. But these commonly stated operations of the lids are such as are bilateral, whereas it is within the observation of every one that, under the control of the will, the lids may be closed singly by most individuals. Obviously, therefore, we must seek lid functions other than those stated, and I venture to make this explicit statement of a fact, to which, so far as I can learn, attention has not hitherto been called: An important function of the eyelids in man is that of enabling him by the voluntary closure of one eye to secure monocular vision. I would not by this imply that the closure of one eye to avoid

diplopia, for example, has not been noted and described again and again, but the point I wish to make is that individuals having normal binocular vision frequently relinquish it temporarily, and, for reasons to be stated later, employ the vision of one eye, and to the dependence thus placed upon the ability to close one eye independently I can find no reference in scientific literature.

The functions of protecting, moistening, and cleansing the eyeball may be considered the primary or lower functions of the lids. On the other hand, so far as the lids assist in the act of vision, as in myopia, or in winking to secure monocular vision, the functions may be considered secondary or higher. Adopting this distinction, we see that the lower functions are, as a rule, reflex, and thus secured to the individual as are other important acts fundamentally necessary to his preservation, while those secondary functions which have to do with perfecting his vision and rendering it more especially adapted to the work at hand are under the control of the will.

The reasons impelling an individual to close one eye thus dispensing with binocular vision, may be grouped in three classes: (1) protective, (2) visual, and (3) expressional.

In the first class, *i. e.*, protection against dust, wind, smoke, excessive illumination, etc., the end would be more thoroughly secured by the closure of both eyes, the function as usually stated, such as we see in their reflex sudden closure when imminent danger presents; but if on a windy day when the dust is flying we should attempt to protect our eyes by closing both, we should do so at the risk of possible danger to our bodies. One cannot, for example, safely walk along the streets with both eyes closed. Ordinarily, therefore, the monocular vision permitted by winking under such circumstances, lessens exposure of the eyes by one-half and permits orientation. The unclosed eye is somewhat protected by partial closure, the cilia forming an effective screen. This closing of one eye for protection is easily verified by observing one who extends his head from a car window. If the speed is moderate, both eyes are but partly closed. When, however, the wind pressure increases with the train's speed, and the impact of flying cinders upon the face gives warning of

greater danger, one eye will be tightly closed and barely enough of the other exposed to permit of vision through the lash-protected aperture. This monocular protection may again be illustrated when protection against excessive illumination is to be secured. I am not clear as to how far the subject of photophobia has been studied with reference to the single or double field, but it is easily demonstrated that at a certain intensity of illumination tolerance with both eyes is painful, while with either eye alone no particular discomfort is felt. This degree of illumination is commonly experienced when the sun shines brightly upon freshly fallen snow. Under such circumstances one eye is entirely closed, the other only partially, if at all.

Let us now consider the peculiar visual advantages secured by the closing of one eye. First and foremost stands the accuracy with which it enables us to determine the position of one point in relation to the line of sight passing through two other points — a process commonly called "lining up" or "sighting." An enumeration of the trades and professions in which this maneuver is of essential aid to accurate work would include almost all of the mechanic arts. To the carpenter who planes a board, to the mason who lays a wall, to the architect who inspects his building, monocular vision seems absolutely necessary for the accuracy and rapidity of his work. Granting, of course, the superiority of binocular vision in its enlarged field and stereoscopic effect, I would call attention to the fact that by closing one eye we are enabled in this act of "sighting" to attain a degree of accuracy far superior to that of any of the visual concepts rendered by the two eyes working together. A locomotive engineer at work about his engine wishes to oil an inaccessible part. Binocular vision will guide the tip of his oil can to the remote bearing with sufficient certainty, but the next moment he may wish to ascertain whether or not a part of his machine is "true," and with one eye closed he is enabled to determine this with almost absolute accuracy. We know that apparent size, shadows, ciliary effort, etc., partly compensate for the loss of stereoscopic vision, but monocular vision alone — by suppression rarely, by winking commonly — enables "sighting" to be done.

Other purely visual reasons for the closure of one eye need only be stated — the avoidance of an imperfect image resulting from recent changes and not yet eliminated by central suppression; the resting of an asthenopic eye while continuing work with the other, and the employment of a more myopic or less hypermetropic eye for close work.

Lastly, in considering expressional winking, we find two apparently distinct varieties, viz., the almost instantaneous closing of one eye, generally with some humorous significance and the deliberate closure commonly accompanied by a tipping of the head to one side and indicating reflective and critical doubt. The former gesture, there is good reason to suppose, is the merest vestige of a surreptitious smile, just as in sneering the raising of the upper lip on one side, thus exposing the canine tooth, is the vestige of a menace. This explanation seems probable when we consider that in smiling the lower lid is wrinkled and the eye partially closed, and that conversely in winking we frequently see the corner of the mouth drawn up and the same facial muscles used as are brought into play in smiling. The present humorous import of this means of facial expression would seem to strengthen the probability of this explanation. In regard to the deliberate and critical closure, I would suggest that it may be explained by the fact that from the most remote times, in fact, ever since primitive man first sighted along an arrow, we have been accustomed to judge critically of much of our handiwork by closing one eye. I think that to one who has carefully read Darwin's "Expression of the Emotions in Man and Animals," the above suggestions concerning expressional winking will not seem far fetched.

Now, in case monocular vision is desirable for any of the reasons stated above, protective, visual, or expressional, which eye is to be habitually used for such purpose or is either to be used indifferently? If both have equally acute vision it would seem that the one or the other would be used at different times, and that finally the habit of winking either eye with equal facility would result, and in a large proportion of individuals we find

that this actually occurs. There is at work, however, another force, to be referred to later, which in a certain percentage of equal-eyed individuals modifies this result in favor of the left eye. When, however, one eye is superior to the other in visual acuity or static refractive condition, we should certainly not expect it to be closed as frequently as the poorer eye, and for the following very apparent reason. With one eye poorer than the other, a man's vision with both open is normally that of the better, and if, for occasional purposes, he closes one eye, he finds that when he closes the better he has worse vision than before. If, however, he closes the poorer, his resultant vision is as good as with both open, and thus he secures the desired advantage of monocular vision with undiminished acuity. I do not wish to be understood as saying that he makes conscious and deliberate choice, but that in the daily necessity for monocular vision it would be strange indeed to find a person satisfied with poorer vision than that to which he is accustomed, when vision equally good is easily obtainable. Unconsciously, perhaps, but none the less certainly, he would, when using one eye select the better more frequently, and thus finally the habit of closing the poorer would be formed. That it is seldom habitual for persons having one very defective eye to close the good eye is shown by the frequency with which we see patients who, having such defect, are ignorant of its existence. We all know how common it is for persons having one almost useless eye to grow up from childhood totally unconscious of the fact, whereas if they had ever, after they were old enough to observe and remember, closed the good eye, the poor vision of the other would immediately have declared itself.

Once formed by superiority of purely visual results and the habit would be strengthened by protective and expressional winking, for the lids more easily closed would be more frequently chosen for these purposes, the nerve stimuli taking the routes already made easy.

Here, then, we have an unconsciously developed habit based upon functional differences, many times slight and in some cases very notable, yet, as a rule, unknown to the individual. What is

the least refractive difference between the two eyes which is sufficient to determine the choice upon which this habit is formed? Donders, "Accommodation and refraction of the Eye," in the chapter on anisometropia, speaks of personal experience by which he found that the placing of + 1.5 Dioptry spherical before one eye determined its use, by preference, for close work. That very much smaller permanent differences in manifest or latent refractive conditions will determine the habitual choice of an eye when monocular vision is desired will be clearly shown by a study of the winking habits of a large number of individuals. A difference of .5 Dioptry of astigmatism and one letter Snellen in acuity appear to be a sufficient determining force in a large number of cases.

As to the age at which this habit is formed and the duration of its persistence after changed visual conditions, my data are not sufficiently full to insure certainty. A limited number of cases leads me to conclude that the habit is acquired before the age of ten — earlier in boys than in girls; and various considerations lead to the conclusion that when once thoroughly formed it persists through life.

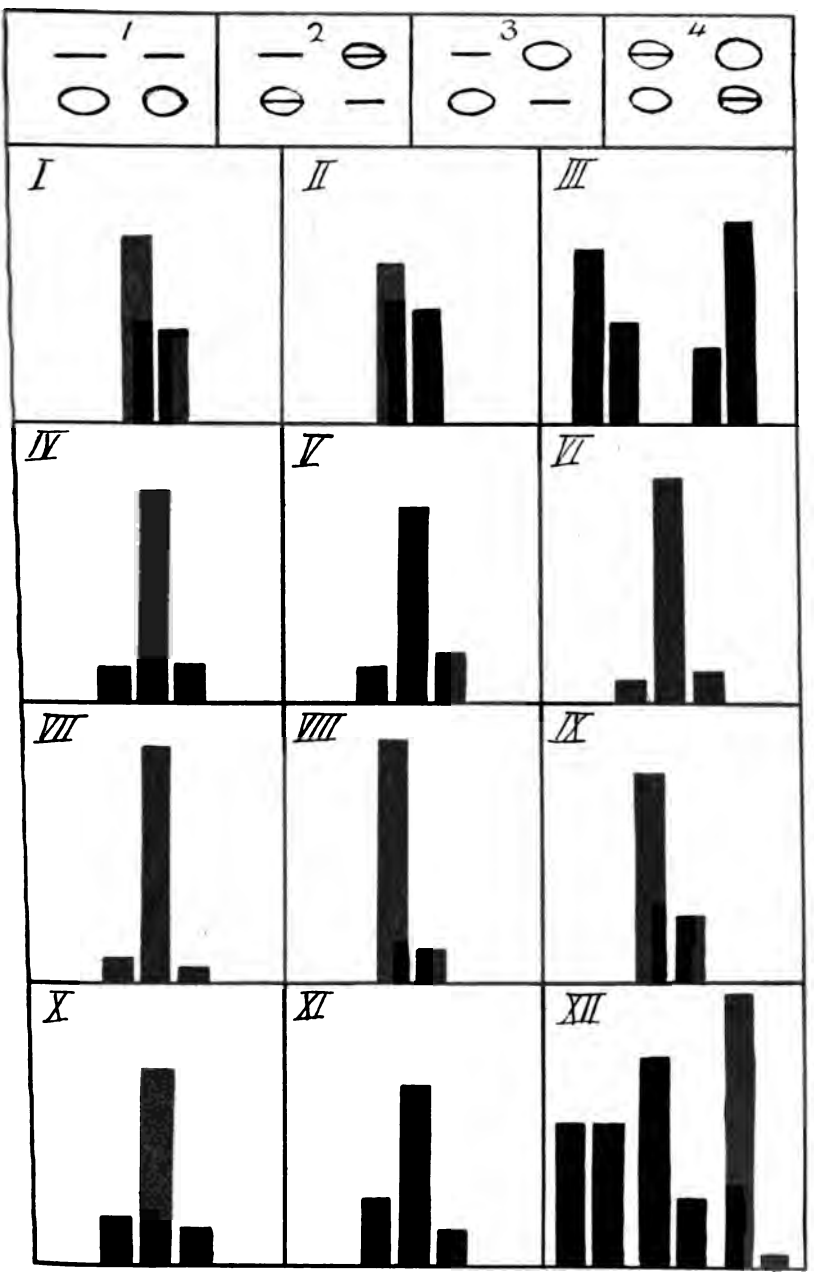
Stated briefly, the results of this habit are that individuals having equal eyes wink equally, and that those who have unequal eyes wink the poorer eye more easily; or, in a more general way, that the comparative facility with which one or the other eye is separately closed is dependent upon and may therefore be used as a test of the comparative visual excellence of the two eyes.

In investigating the truth of these statements, I have collected about 2,000 cases, concerning many of whom the following data have been recorded: Name, age, sex, manner of winking, acuity of vision without mydriatic, and with, in cases in which its use was required, correcting lenses with resultant vision and various other facts which would tend to throw light upon the history of visual conditions. Most of these cases have been seen in private practice, the visual conditions have been thoroughly tested, and the results carefully recorded. The classification has been independently made by two individuals.

My methods of determining the comparative winking facility have been as follows: The subject is asked to wink or close one eye, and the first result obtained is generally a quizzical smile, for such a request made seriously is to most laymen unusual, and suggests to their minds the wink humorous. When the demand is persisted in, one eye or the other is generally closed with apparent ease. The eye which the subject selects under these circumstances is generally the one which he is most accustomed to wink, should a difference exist. Both eyes being again open, he is asked to close the other, and now follows a wide diversity of results. Some succeed with the second eye as well as with the first, each being closed with little apparent effort. Some, however, bring the whole orbicularis into play. Others with still greater effort, contract numerous accessory facial muscles. Still others, winking with even greater difficulty, contract the opposing muscles of the opposite side, notably the occipito-frontal, the effort being divided between keeping one eye open and closing the other. This relative effort in winking we note in all gradations up to the point where the subject raises his hand to aid him in closing the lids, and confesses inability, and, very likely, surprise.

In cases in which the relatively slight difference leaves us in doubt, the test may be reversed. Both eyes having been closed, the subject is asked to open one, and, after again closing, the other. We are thus enabled to judge of the apparent effort exerted by the muscles operating to open the lids. As has been stated, these receive impulses while the contracting muscles of the opposite side are innervated. The experiment is merely a reversal of the first, but sometimes much more delicate in its results. The sensations experienced by the subject — the sense of effort and feeling of awkwardness — are almost invariably in accord with the results of the objective examination.

When one eye is closed with difficulty, the other easily, this result is, in most instances, surprising to the subject, who is generally ignorant of the fact that he cannot close one as easily as the other. Very rarely we meet with a person absolutely unable to close either eye independently, although many are unable to


1
2
3
4
I
II
III
IV
V
VI
VII
VIII
IX
X
XI
XII

close one while no trouble is experienced with the other. In this latter case, also, the individual is generally ignorant of the fact that he has always winked the same eye.

In recording this comparative winking facility, I have used the symbols shown at the top of the accompanying plate. These symbols have been adopted by me as simple and sufficiently accurate. An eye easily closed is represented by a short horizontal line, typifying the closed palpebral fissure. An eye which cannot be independently closed is indicated by a small circle, typifying the open eye. The combination of these two symbols, *i. e.*, a circle divided horizontally by a dash, means that the eye is closed with comparative difficulty. With the symbols for the two eyes placed side by side, the one at the left represents the right eye — as if they were the eyes of a face looking out from the page. Referring to the top of the accompanying plate, the upper of the two pairs numbered one is supposed to represent two eyes, either of which can be independently closed as easily as the other. The two circles below represent the eyes of an individual who can close neither separately — whom I call a non-winker. In number two, one eye is closed more easily than the other — above, it is the right; below, the left. In three, we see absolute inability to close one eye, the other being closed with more or less ease, while in number four are represented the eyes of those who are absolutely unable to close one and who close the other with such difficulty as to show that it has never been an habitual act.

In deciding the comparative visual excellence of two eyes, some difficulty is occasionally met with. It would seem an easy matter to determine whether two eyes are equally good visually, and, if not, which is the better; and it would be easy if all patients were trained observers, if the mydriatic, when employed, always gave complete paralysis, and if the ophthalmologist were never a little careless or hurried or mistaken. In deciding, from my case records, whether or not two eyes are visually equal, and, if not, which is the better, in doubtful cases I generally place most reliance upon the evidence, whenever available, given by the

correcting lenses, since their selection is the part of the examination which is, as a rule, most carefully conducted.

In attempting to classify the material collected, in regard to the comparative winking and visual ability of the two eyes, we are again reminded of the novelty of the investigation by the absence of any ophthalmological terms to denote an equality or inequality of visual acuity of the two eyes. In the earlier paper previously referred to we ventured to coin the terms " isopia " and " anisopia," meaning, respectively, equality and inequality of visual acuity. Making use of these terms in our classification, we find that, excluding for the time those who cannot wink and those who cannot see, we have five classes. With equal eyes (isopia) one may wink equally or unequally. With unequal eyes (anisopia) the same alternative presents itself. Were it not, therefore, for the individuals who have unequal vision and who wink unequally there would be but four classes. It is evident, however, that with unequal eyes and unequal winking either the poorer or the better eye may be closed with greater ease, my proposition being that in far the larger proportion of cases the poorer eye is, as we should naturally expect, the more easily closed.

	Equal Winkers.	Unequal Winkers.
Equal Eyes (Isopia)	B	C
Unequal Eyes (Anisopia)	D	E / F

As will be seen by reference to the diagram above, we may classify cases from either of two original points of view. Starting with individuals having equal eyes, for example, we may divide into those who wink equally and those who wink unequally (classes B and C in the diagram), or we may begin with those who wink equally and divide into classes B and D, those who have equal or unequal eyes. For practical purposes,

of course, we should be obliged to take comparative winking as our starting point, and show, for instance, how large a proportion of those winking unequally wink the poorer eye more easily; but to establish the physiological fact that there is a relation between comparative winking facility and comparative visual acuity we may make use of a knowledge of both factors and ask how many of those who wink unequally and *have unequal eyes*, wink the poorer eye more easily, although in the practical application of the rule we could presuppose a knowledge of nothing but the winking.

If visual conditions have any determining influence on winking, the largest number of individuals should be in classes B and E (see diagram), *i. e.*, we should expect to find that persons having two equally good eyes would wink one as easily as the other, and of those having one eye better than the other, we should expect a preponderance in favor of those who close the poorer eye more easily. The exceptions are classes C, D and F — C being the most numerous for reasons to be stated later, and D and F (those who, having unequal eyes, either wink equally or close the better eye more easily) being by far the smallest classes.

Let us now take up that class of individuals who have equal eyes (isopia) and see in what proportion the vision seems to have determined the habit of winking, *i. e.*, what percentage of those having equal eyes wink equally.

Of 131 individuals carefully examined and shown by several tests to have two eyes of absolute visual equality, 67 per cent. wink as we should expect, *i. e.*, equally. Among the remaining 33 per cent., who, in spite of their isopia, close one eye more easily, we find the workings of a tendency hinted at above, namely, that, other things equal, there is a certain residual force determining the closing of the left eye. The explanation seems to be this: In all of those innumerable operations of "sighting" it is habitual for most of us to use the right hand if an object is to be lifted. Consequently, it is brought in front of the right eye, and the left is closed. The right-handed sportsman or soldier raises his gun to his right shoulder. A boy using

a bow and arrow, or a carpenter planing the edge of a board, uses his right hand and right eye in the same way. If this is a true cause, we should expect to find this determining force more potent in men than in women on account of the difference in their occupations; and such is the fact, for, while 80 per cent., or four-fifths, of the equal-eyed men who wink one eye better than the other unconsciously wink the left eye, the proportion among women is but 58 per cent.

Another probable cause, acting in both sexes to make this class of exceptions among the equal-eyed comparatively numerous, is a certain inertia or economy of effort which would lead some who had partially learned to close one eye as a means of facial expression to make no attempt with the other. Having two equally good eyes, there is not the positive incentive to wink both equally that there is among those who have one poor eye to wink that one instead of the good one. It is certainly a fact, whatever the true explanation may be, that the equal-eyed do not wink equally with the same persistence shown by the unequal-eyed in winking the poorer eye. In diagram I of the accompanying plate are graphically shown the proportions in this series of 131 of the equal-eyed. The taller column represents the number who wink equally. Diagram II represents the same class, the equal-eyed, in larger numbers (312), but with visual equality not so carefully ascertained, hence the larger proportion of apparent exceptions.

It is, however, in the class of anisopic individuals that the dependence of winking facility upon visual conditions is most clearly brought out. As before stated, we here have three possible sub divisions as to comparative winking facility — those who wink equally, those who wink the better eye more easily, and those who wink the poorer eye more easily, but small indeed, are the first two classes. Of 239 individuals, the visual condition of whose eyes has been carefully ascertained and an inequality between the two of not less than .5 Dioptry found, but 12 per cent. wink equally, only 13 per cent. wink the better eye more easily, while 75 per cent. close the poorer eye more easily.

The proportions in this series are shown in diagram IV of the plate, in which the first column represents those who wink equally, the third those who wink the better eye, and the middle column those who, in accordance with the rule, wink the poorer eye more easily. Now, when we eliminate those who wink equally, and consider those only who, having unequal eyes, wink unequally, we find that 86 per cent. close the poorer eye with greater facility, as against but 14 per cent. of exceptions.

In another series I have collected ninety-eight cases in which the visual conditions are these: In one eye the vision is normal, while in the other there is some congenital defect which prevents the attainment of vision better than 16/30 with any lens. Of these, 80½ per cent. wink the poorer eye more easily, 7½ per cent. wink equally, while 12 per cent. close the better eye more easily. These percentages are shown in diagram V. If we consider those only who, having unequal eyes, wink unequally, we find that 87 per cent. are in accord with the rule — they wink the poorer eye more easily.

Selecting cases of still greater difference in visual acuity, one eye being capable of nothing better than 16/200, while its fellow enjoys good useful vision, we find the exceptions still fewer. Of seventy-one individuals in the series, 84½ per cent., as shown in diagram VII, wink in accordance with the rule, while if, again eliminating the equal winkers, we confine ourselves to the unequal-eyed who wink unequally, we find 93 per cent. winking the poorer eye with greater ease. In other words, if the patient winks unequally, and if we know that one eye is markedly defective, we can pick out the poor eye nine times in ten.

But most convincing of all is a series of seventy-three cases who wink one eye only, being absolutely unable to close the other independently, and who have markedly unequal vision. Here no mistake can have been made in judging either the comparative winking facility or visual acuity. How many wink the poorer eye? Eighty-nine per cent., as shown in diagram VIII.

There would then seem to be no room for doubt as to the physiological fact that unequal visual acuity is a controlling factor in unequal winking facility.

Another series illustrates the rule very prettily. Of twenty-eight young men of whom nothing is known except the vision without mydriatic, and whose vision tested in this rough way shows a difference between the two eyes of but one letter Snellen, fourteen are for the rule and fourteen against; of thirty-three with a difference of two letters, 76 per cent. are for and 24 per cent. against; while of twenty-five with very marked difference, but 4 per cent. are found to be exceptions. We thus see that the more certain and more marked the visual differences, the more surely does the rule point to the poorer eye. These three groups are shown in the three pairs of columns shown in diagram XII.

In concluding the consideration of unequal-eyed individuals it may be well to state that among the exceptions who wink the better eye more easily are found quite a large proportion of myopes, probably explainable in some cases by the fact that the myopia developed after the winking habit had been formed, and in others to the early and frequent use of the more myopic eye for close work. In these latter cases, if there was in early youth very much close work to be done, the more myopic eye might easily have been the one chosen for monocular purposes.

Now taking the other point of view and starting with a knowledge of nothing but the winking facility, what conclusions can we draw as to visual conditions? As a practical test of comparative vision, what degree of certainty would my statistics lead one to expect? Knowing only that an individual closes one eye as easily as the other, in what proportion of cases would we be right if we predicted equal visual excellence? Out of 115 individuals who wink equally, I find that nearly 76 per cent. (diagram IX) have isopia, their eyes being equal in original acuity, equal after mydriasis, and requiring the same correction, if any.

Again, presupposing the knowledge of nothing but that one eye is more easily closed than the other, we should be right in 70 per cent. of cases in saying that this is the more defective eye. In 17 per cent. the eyes would be equal, and we should find 13 per cent. winking the better eye (diagram X). It will be seen that the majority of these exceptions have equal eyes, so that if the test were made to avoid a poor eye, *e. g.*, in selecting an eye for

cataract extraction, the rule would enable one to do so in 87 per cent. of cases, *i. e.*, in that proportion of individuals one would be able to select an eye either as good as, or better than its fellow. If we confine our attention to the consideration of *men* winking the *right* eye more easily, we find that this is the poorer eye in 86 per cent. of cases, instead of 70 per cent. in which neither sex nor right or left is specified. This higher percentage is, of course, due to the elimination of part of the male equal-eyed individuals on account of their tendency to wink the left eye, so that if we find a *man* winking his right eye more easily than his left, we are pretty safe in saying that his right eye is the poor one.

One other class, small in numbers but presenting some interesting peculiarities, yet remains to be considered — those who cannot wink either eye independently. By far the larger part of this class consists of the congenitally blind, who have no incentive for closing one eye separately, and the very young, who have not had the requisite experience. Among twenty congenitally blind, having good bilateral lid motion and eyes of normal size, all but one were absolutely unable to wink, and the facial contortions of that one made it very evident that the act was most unaccustomed.

But of older persons not congenitally blind there is a small residuum of non-winkers. Of 1,969 individuals, eighty-five were found to be unable to wink either eye. In the distribution of these between the sexes a remarkable disparity of proportions is observed. Among 1,343 men only eleven (less than 1 per cent.) non-winkers were found, while among women seventy-three in 626 (12 per cent.) were unable to wink. This disproportion between the sexes in the matter of winking ability is probably the result of differences in occupations and manner of life. In her occupations, woman finds less use for monocular vision, and, her life being less out-of-door, her eyes do not require lid protection so frequently. After what has been said we are not surprised to find in this class of non-winkers defective vision in a large number of cases. Seven of the eleven men had worse than 16/30, in one or both eyes. Of the women, 73 per

cent. had the same poor vision. This defective vision of non-winkers is more striking when compared with the excellent vision which obtains among those who represent the highest degree of winking ability, namely, those who wink equally well with either eye. Among these we find the vision 16/30 or better, in 62 per cent. of cases. Among non-winkers the conditions are reversed and we find 73 per cent. with vision poorer than 16/30. Thus does the winking test show in a rough way not only relative but absolute visual conditions. This comparison is shown in diagram III, in which the first two columns represent the equal winkers and the last two columns the non-winkers, the first column in each pair showing the proportion of those who have 16/30 or better.

In answer to a possible question as to the practical value of the winking test, I would offer the following suggestions: In the case of a cataract patient having two opaque lenses, we have at present no trustworthy means of avoiding the selection of a defective eye for operation. The patient may give no history of poor vision in one eye before the appearance of the cataract; he may pass the candle test with flying colors, and still have had during his whole lifetime a marked defect of the deeper structures, which has seriously reduced his vision in that eye. Is there not real value in a test which will enable us to avoid such an eye nine times out of ten, and to proceed practically without fear that the results of a well-performed operation will be negatived by the unwitting choice of an eye long since useless?

Again, should one find an individual who violates this rule by winking the even very slightly better eye more easily, one may reasonably suspect some recent change and be impelled to a thorough search, possibly to the discovery of incipient cataract or chronic glaucoma, for example.

Or a patient may present himself in great mental distress because of the sudden accidental discovery of a long-standing visual defect of one eye, and one may wish by some simple test to convince him that he has had this same defect for years, probably since birth, and is, consequently, not "getting" blind. In this

same way, the test might be of use before a jury in a civil suit for damages, as strengthening the probability that a certain defect is or is not of recent origin.

In general, by distinguishing recent from long-standing defects, it gives us a hint as to the history of an eye, which in many cases we could get in no other way.

A CASE OF SYMPATHETIC NEURO-RETINITIS — RECOVERY.

By J. P. WORRELL, M.D.,

TERRE HAUTE, IND.

Miss H., æt. 23, consulted me on the 27th of January, 1892. She stated that on the 17th of November, 1891, she had received an injury of the left eye by the thrust of a knife at the edge of the color of the eye, followed by the appearance of a small tumor about the size of a pin-head. She was treated by a local physician, who attempted to destroy the "tumor" by the use of lunar caustic. This application was followed by excruciating pain, lasting for several hours, on which account she refused to permit a repetition of the cauterization which was urged by the physician for cosmetic reasons. She however, consented to the application of a weak solution of the caustic, this being made on alternate days up to the time of her first visit to my office. She stated that all redness of the eye had disappeared by the middle of December. About the beginning of January, some impairment of the sight of right eye was noticed, and a week later that eye became injected, with fugitive pains in and about the orbit. Her condition at the time of her first visit was as follows:

Left eye quiescent; at inner-lower limbus a small flat pigmented cicatrix surrounded by a crescentic leucoma; anterior chamber deep except at the site of the leucoma, where it is encroached upon by the iris, which was adherent to cicatrix of wound at that point. Pupil dilated *ad maximum;* its circular shape but little changed by adhesion of the periphery of the iris to the cornea, no tags of pigment nor other evidence of iritis having

been present. Vitreous clear. Reflex from entire fundus white, like that received from the disc in conditions of health. Details of the disc obscured; margins invisible; veins relatively full, and all vessels veiled. The surface presented a uniform gray appearance, characteristic of edema of the retina. The surface in vicinity of disc could be seen with +4 D.; field complete; color perception normal. Counts fingers at 20 inches.

Right sclera injected, being of a pinkish color. Iris apparently healthy, normal in movement and reaction; dilatation *ad max.* under mydriatic, when there is noticed a number of pigment tags, corresponding to small synechiae which have ruptured under a single instillation of atropine and which correspond to small pigment spots situated upon the anterior capsule. Anterior chamber deep. Vitreous free from opacity. The fundus, except in unimportant details, is like that of the left eye. Refraction the same. Projection good. Field complete; color perception normal. Counts fingers at 20 inches.

Patient was put to bed in a dark room and placed under the use of mercurial inunctions and iodide of potassium, with atropine locally. Every third day she received an injection of pilocarpine, which acted admirably, causing profuse perspiration and being attended by no nausea or other discomfort.

In a few days the redness of right had disappeared and manifest improvement of sight had taken place.

The progress of the case was uneventful, gradual improvement taking place in both subjective and objective conditions. The swelling of the nerve and retina gradually subsided, the grayish color gradually giving way to the normal hue of the fundus, and the margin of the disc reappearing.

May 6, 1892. Margin of disc slightly veiled on temporal side, color pale and definition of the parts rather indistinct, as though the tissues were somewhat opaque. Retinal pigment, except in vicinity of nerve and macula, has been absorbed, exposing the choroidal circulation. Distributed irregularly throughout the fundus are seen dark stippled masses of pigment shading off gradually into the color of surrounding fundus. No

black uniformly pigmented patches. The stippled areas are slightly veiled, as are also the retinal vessels which may pass through them. Relative size of vessels normal, but all rather small. Fundus seen with +2 D. V. = 15/XX.

Left cornea shows a small crescentic leucoma surrounding the site of former hernia of the iris. Pupil freely movable, somewhat pear-shaped, its apex being lost behind the leucoma above mentioned. With the exception of unimportant details, the fundus resembles that of the right. Refraction + 2 D. V. = 15/XX.

On the 5th of August, 1892, a month after the suspension of all treatment; vision was found to be in the right 15/XX; in the left 15/XXX; unimproved by glasses.

The tissues involved and the order of sequence in which they became implicated make the case a very interesting one, and is submitted as having a bearing on the question of the modes and avenues by which diseased processes are communicated from an injured to a healthy eye.

REMOVAL OF CALCAREOUS (SILIQUOSE) CATARACT.

By HENRY D. NOYES, M.D.,

NEW YORK CITY.

The following mode of extracting a shrivelled or calcareous cataract has been twice employed with entire success, and possesses advantages which seem to make it superior to the ordinary methods. The object is, of course, to secure a round, central, and clear pupil. We expect to have a fluid vitreous; there is probably detachment of the retina; there is no perception of light, and the operation is done to remove the blemish caused by the conspicuously white pupil. The cases are frequently the result of an injury, and, of course, have existed for a long period. The object aimed at is to get out the lens in the simplest way with the least traumatism, through a wound which shall be the most

favorable to immediate union, with the least tendency to escape of vitreous and to intra-ocular hemorrhage. As a matter of course, there must be the least possible chance for prolapse of iris.

The method which seems to meet these conditions is the following: Employ the usual antiseptic precautions for cataract extraction. Secure full dilation of the pupil; give an anæsthetic to full relaxation. With speculum and fixation forceps in position, make an incision entirely across the cornea in the horizontal meridian, using a narrow Graefe's knife. As the apex of the cornea is being divided, release the fixation forceps. With iris forceps whose teeth project, seize the thick capsule and gently pull out the whole lenticular mass, helping the tearing of the zonula by a little to and fro movement. So much has the zonula atrophied in almost all cases that it makes no perceptible resistance.

In both the cases operated on, I was delighted at the facility with which extraction was effected. No threads of tissue lingered in the wound, almost no loss of vitreous, and no hemorrhage happened. The eye was bandaged and treated in the usual way; in about ten days the patients were well.

The first case was operated on in 1878, a physician and oculist who was greatly pleased with the result. The second case was operated on in 1894, a young man aged 24, whom I saw again in December, 1897. In him, as in the other case, the corneal wound could only be seen on critical inspection. It was a very thin, faint line, perfectly regular, the pupil, central and active, entirely unattached. To all appearance the eye was normal. Examining the eye of the second case by Javal-Schortz ophthalmometer, there was found a somewhat irregular astigmatism of 6 D. By the ophthalmoscope the retina was found detached and broad membraneous bands of connective tissue were seen passing from the fundus forward to the ciliary body.

Making the sections transversely across the cornea gives a perfectly linear wound, which has the greatest tendency to immediate union, and is the least exposed to prolapse of iris. To deviate from this position, as in Le Brun's incision, is to invite

risk of prolapse. To make the wound more peripheral adds to the difficulty of grasping the capsule. As a matter of course, instrumental delivery must always be employed, and both lens and capsule secured together. Kuechler proposed this kind of wound for ordinary extraction, but its unfitness for these cases was sufficiently demonstrated in the second case by the irregularity and high degree of astigmatism, notwithstanding the good appearance of the cornea. In both the above cases there were no adhesions of the pupil. I do not think marginal pupillary adhesions would offer any serious hindrance. They could easily be loosened by a fine platinum probe bent at its tip to a right angle. If the lenticular mass were adherent to a considerable extent of iris, and the latter atrophied, there might be difficulty, and any method of removal be deemed unjustifiable. For less severe cases the operation described is certainly appropriate.

THE HAAB ELECTRO-MAGNET AS A SIDEROSCOPE.

By P. A. CALLAN, M.D.,

NEW YORK CITY.

During the past twenty-five years various surgeons have experimented on the human eye with the magnetic needle as a sideroscope. The results have not been encouraging, if we except those of Dr. Asmus. He claims, however, to have gotten excellent results with his sideroscope, which is essentially a suspended magnetic needle. Dr. Skeel has constructed a somewhat similar instrument, but he found that the vibrations of ordinary street traffic caused so much oscillation of the suspended needle as to render the results unsatisfactory. That is the greatest objection to this form of sideroscope; it is too sensitive for ordinary use in our large cities. It is almost impossible to determine whether the oscillations are due to the iron or the vibrations incidental to city life.

I have found the Haab electro-magnet of great service in detecting the presence of iron or steel in the human eye. Its use

requires care and much patience, for in some instances several attempts were necessary before positive results were obtained. This is especially the case where the foreign body is very small or if it has been in position some time, so as to become fixed.

The following method of procedure will give the best results:

First. Thoroughly cocaine the injured eye.

Second. Place the patient on a stool close to the instrument.

Third. Bring the eye of the patient against the point of magnet and move the eye so that it comes in contact at various places on the exposed globe.

Fourth. Watch carefully for any bulging or movement of the globe toward the electro-magnet point when in contact.

Fifth. Question patient during this examination as to pain, pulling, or drawing sensations.

The effect of this manipulation is to magnetize the iron if it is within the globe; and the bulging at the point of contact, or the pulling, drawing, and pain, indicates the presence of the foreign body. If the examination is made shortly after the injury, we may be fortunate enough to draw the metal through the original opening. I am much indebted to Dr. Davidson, house surgeon New York Eye and Ear Infirmary, for his very valuable assistance in the examination and histories of the following cases:

Samuel Kronenian, aged 32. Came to New York Eye and Ear Infirmary March 4, 1898, on account of his left eye. While at work March 1, 1898, was struck by a piece of iron in the eye, which gave him but little trouble.

Examination showed a central wound of cornea; iris intact, pupil moderately dilated; lens opaque down and inward. Impossible to see foreign body with the ophthalmoscope. After three attempts it was possible to demonstrate the presence of the iron in the fibrinous chamber. Patient complained of a drawing sensation, which was at times painful, and the sclera could be seen to bulge toward the point of E. magnet. Patient refused operation for its removal. Three months later he was seen by Dr. Davidson, who found the eye very irritable and in a condition of irido-choroiditis.

Frank Egan; diagnosis, " F. B." in globe O. D. Admitted, January 15th; discharged, February 5th.

January 15th. Three hours ago was walking in the street and was struck in eye by piece of steel which flew from hammer of stonemason as he was passing. Was seen at clinic three hours later, at which time a small wound 2 mm. in length was observed in cornea at point slightly above horizontal meridian, near limbus on nasal side. A corresponding wound could be seen slightly above that of cornea at root of iris. Ophthalmoscopic examination: vitreous filled with floating opacities; at one point, downward and outward, a hemorrhagic exudate could be seen. At present great quantities of floating opacities can be seen in vitreous. Treatment, atropine and ice applications.

18th. Eye shows moderate reaction.

19th. Slightly more reaction. Ophthalmoscopic examination: still large quantity of floating opacities downward and outward. White exudate can be seen extending from horizontal meridian downward to most dependent portion of globe, at which point a dark mass can be seen surrounded by a silver reflex. Patient approached to electro-magnet, experienced acute sensation of pain, distinctly referable to lower part of globe. More marked reaction. F. B. can be seen with ophthalmoscope. Operation cocaine. Incision made with Graefe knife through conj. and sclera on outer side, length of incision 6 mm. Small magnet introduced, and after several attempts steel was removed in contact with magnet; was shown to be triangle piece of steel 1 mm. at base, length about 1½ mm., weight gr. 1/20. Treatment, ice applications.

20th. Mod. reaction. Bright red reflex from fundus. Pupil well dilated. Ice applications continued.

22d. Stitches removed; wound entirely healed.

February 5th. Inflammation entirely gone. Reflex from fundus can be gotten. Pupil dilated. V. = fingers. Discharged.

James Graham; diagnosis, " F. B.," globe O. S.

April 4th. Patient was struck in eye by piece of iron two months ago which was chipped from piece of wrought-iron which was being hammered by him. He stated that eye was intensely inflamed for three weeks and that ten days ago sight vanished. P. S. Eye slightly injured, cornea clear, O. C. shallow, iris irregular and adherent to ant. cap. at several points. Lens cataractous. Patient approached large magnet, and after repeated trials he experienced an abnormal sensation, and the

iris could be seen to bulge forward against cornea in sup. out. quadrant. Operation cocaine — section with keratome, which was enlarged with scissors. Mod. broad iridectomy was done. Cystotomy performed, after which the lens was expressed, broken up together with minute body of iron about one-half size of pin-head; weight *1/6 of a grain.* Pupil left clear. Pillars of coloboma free; wound adjusted; 3 per cent. atropine.

6th. Wound closed; anterior chamber restored; very little lens substance remains.

13th. Pillars of coloboma free; eye entirely quiet. Discharged cured.

John Thelan; diagnosis, " F. B." in globe O. D.

May 13th. Twenty-four hours ago patient was struck in O. D. by piece of steel which was chipped, causing an incised wound of cornea, vertical in diameter, located in lower outer quadrant, and is surrounded by haziness and infiltration that involves about one-third of its area. Perforated wound of iris exists, corresponding to that of lower part of cornea. Lens cataractous in lower one-half. Deep structures can be seen above lens. Patient approached to electro-magnet, and after number of trials the sclera below cornea was seen to bulge. Treatment, bed, atropine, and constant ice.

16th. Each trial with magnet caused bulging of sclera immediately below cornea. Eye shows more reaction. Operation cocaine. Incision in inf. temp. quadrant through sclera, followed by escape of few drops of vitreous. Tip of small magnet introduced and passed downward below and behind lens to region where bulging was seen. F. B. was withdrawn with magnet at first introduction; weight 1/12 grain. No suture. After two hours bandage removed and constant ice applied. Atropine.

17th. Moderate reaction. Patient had some pain in night.

23d. Reaction has increased, since operation, from day to day. Patient suffers intervals of pain. V. = O. Eye presents picture of panophthalmitis. Operation ether. Enucleation. No suture S. B. Bandage removed in one hour afterwards. Constant ice. Moderate reaction.

24th. Socket healing normally.

Diagnosis, " F. B." in globe O. S.

March 24th. Patient struck in O. S. two weeks ago with iron. Has been treated by Dr. ——— with ice-cold applications. P. S. Iris irregularly dilated; numerous points of post synechiae. Lens cataractous. Moderate ciliary tendency and pain. V. = O. Treatment, bed, hot bath, and atropine.

28th. Eye shows more marked reaction. Operation ether. Sec. with Graefe knife in one-half limbus. Iris seized with iris forceps, withdrawn, and excised. Free capsulotomy with cystotome. Lens easily expressed with spatula, after which great deal of exudate can be seen post. to lens cap. Small magnet introduced and passed to lower segment of globe and withdrawn with small piece of iron adherent. Dimensions of iron 1x2 mm; weight gr. 1/16. As much of exudate as could be seen was withdrawn with forceps and interior of eye irrigated. Microscopical examination shows staphylococcus and streptococcus. Wound in good apposition.

29th. Mod. reaction.

April 3d. Globe shrinking; inflammation remains; marked ciliary tenderness; very little pain. Treatment, constant hot bathing.

9th. Globe tender and shrunken. V. = O. Enucleation advised and refused. Discharged unimproved.

LEARNING TO SEE AT 40, FIRST WITH ONE EYE, AND LATER WITH BOTH.

BY JAMES L. MINOR, M.D.,

MEMPHIS, TENNESSEE.

I don't know that my pretentious title is justified by the crude article which follows. It is based upon my experience with a patient forty years old, who had been blind from birth, and was made to see at my hands. *My* first tests for vision; *his* first efforts to see; *his* first impressions of vision; and the processes by which conclusions were reached, through his new sense of sight, may be an occasionally-told tale; but his quickness and accuracy in reaching conclusions are certainly rare; and the fact that color-perception, and binocular-vision, were acquired without cultivation or experience is new, so far as I know.

The fields of vision, the amount of vision in the periphery of the field, the color-fields, and the muscular condition, are additions to our fund of information.

Some of his experiences as a blind man are so remarkable that they will be briefly referred to.

Mr. J. H. P., aged 40, who had been blind from birth, consulted me November 15, 1895, concerning his eyes. I found a dense, brilliantly white cataract in each eye, with perception and projection of light, but nothing more, in all parts of the field of vision. Tested with bright red, green, and blue transmitted and reflected lights, he showed no recognition of color. He was a well-developed, healthy man. One brother was affected like himself; otherwise, his family history was good.

He was a remarkable individual — quick-witted, shrewd, observant, but uneducated. Thrown upon his own resources in early life, he had made his own way in the world, and accumulated some property as a farm laborer. He could cut wood, mall rails, split shingles, pull fodder and corn, pick cotton, etc., almost as well as his seeing companions. He had been storekeeper, illicit distiller and dispenser of whisky, United States prisoner, and a successful horse-trader, telling the age, color, and other qualities of a horse by his sense of touch. As a sportsman, he followed the hounds on foot in their chase after 'possums, coons, and even foxes, and was usually at the wind-up, often got the brush, and was never at a loss to reach home.

His sense of location and direction, and his recognition and avoidance of obstacles in his path were unerring and uncanny, and were compared by himself and his friends to the instincts of certain animals.

He reached Memphis from the wilds of his country home, two hundred miles distant, at 11 P. M., and went at once to St. Joseph's Hospital, where I first saw him at 2 o'clock the next afternoon. The day had been cloudy and overcast, so the light could have given no indication of the points of the compass; and yet when I asked him the direction of his home, after very slight hesitation, and turning back and forth a few times, he pointed directly south, the direction of his home. He was taken from his ward down a long hall, and, after two half turns, into a dark room, for ophthalmoscopic examination. After this, he was told to make his way back to his room. He did so without difficulty, avoiding obstacles placed in his path in the darkened

hall, and going down the center of the ward to his bed and chair, in spite of the fact that he was assured he was wrong. He could tell colors by touch. Blacks and whites were instantly recognized. Reds, greens, and blues were accurately selected without much fingering; whereas mixed colors were correctly described as light or dark. He could not explain his peculiar acquirements; as to location and direction, he "jest knowed" where he was and which way to go; and obstructions in his path were recognized by the same vague but reliable process. Colors felt unalike, but the differences could not be explained.

He said he did not know or care anything about seeing, for he had always gotten along well enough as he was, but he had been so frequently urged to have something done to give him sight, that he had come up to have one eye fixed, and, if he liked it, the other one might be treated later.

He urged objections to every condition imposed by the operation, but finally yielded, as if conferring a great favor upon me, in allowing me to remove one of the cataracts. I operated on the left eye under cocaine, and succeeded in extracting, without an iridectomy or accident, a large lens densely white, and of putty-like consistence throughout. With the exclamation, "I can see," he became a changed man. His one object in life was "to see." All objections to my directions ceased, and my suggestions became the laws of his life.

The eyes were bandaged, and he received otherwise the customary treatment for such cases. Progress was normal. The eyes were dressed from time to time, as was deemed advisable, but he was not allowed to see until the bandage was taken off on the tenth day, in a moderately-darkened room. The healing process had taken place with a minimum of inflammation. The ball was free from redness, and presented practically the appearance of a normal eye. To ascertain what he could see, and at the same time to learn what impressions were conveyed to his mind by a sense that was entirely new to him, I made the following tests: Having previously satisfied myself that *square* and *round* objects were understood through his sense of touch,

a square box and a round ball were submitted, separately, to his ocular inspection, for the purpose of getting his ideas of such *dimensions* when seen. The first tests were negative. He said he could see what was held before him, but had no idea of the shape. When pressed for some expression of opinion, he answered, rather petulantly, that he never saw anything before, and could not form an idea of such things, unless he could get his hands on them. The third effort, however, was successful. He took a good look, closed his eyes, and, after a few moments, said he thought it (the box) was square, and, in like manner, the ball was pronounced round. He evinced much pleasure when allowed to verify these impressions by touching the objects with his fingers.

The bandage was re-applied, because I wished to control the use of his eye. The next day it was removed, and to get his impression of *size*, he was asked to indicate his idea of one foot, which he did correctly on his walking-cane. A stick twelve inches long and one inch in diameter was then shown him, which, after some hesitation, was thought to be four inches long, and the size of his finger. His mistake was quickly rectified when the stick was placed in his hands. To designate in *numbers* the objects held in front of him was a great puzzle. He knew there was a difference between one or more, but was at a loss to tell what it was. In the course of four or five trials, however, he was able to say that there was one, or that there were two; and finally mastered them up to five, but not beyond that number.

Tested as to colors, he recognized, not confidently, but without much hesitation, reds, yellows, greens, and blues. The others were called, correctly, light or dark. His appreciation of *shade* may be thus illustrated: As soon as I finished testing his color perception, he told me he had supposed there were only two kinds of people — the whites and the negroes — the former white, the latter black in color; that he knew me to be a white man, and yet my face was not white when compared with my shirt-front. When he saw a negro some days later, the contrast between the black skin and the whites of his eyes and his

white teeth, appealed to him strangely. He said the negro looked as if he was frightened.

That he was a close observer and reasoner is thus shown: The day his color-perception was tested, I showed him a glass tumbler, and asked what it was. After close scrutiny and some hesitation, he said he thought it was a drinking-glass. He explained his reasons for thinking so by saying that the shape of the object was that of a tumbler — outlining it by movements of his hands — and he knew it was glass, because it was clear — he could see through it.

I endeavored to get some idea of how *visual impressions appealed to him*, and his methods of reaching conclusions from them. It was this: He would take a good look, so as to fix the image on his mind, close his eyes, and imagine his fingers were playing over the object or objects. Only after this process had been gone through with could intelligent conclusions be reached.

As to his perception of colors he had no explanation to offer; nor have I. It is simply a fact that pronounced colors were correctly recognized the first time they were seen, without previous visual knowledge or cultivation, by an eye forty years old.

I kept him under observation for a month longer, and while incidents connected with the development of his sight were of much personal interest, they were otherwise unimportant. He had not entirely given up the method of reaching conclusions just described, but was less dependent upon it. Every new object seen, with which he had been previously familiar, continued to surprise him, as appearing to be one-third the size of what he had supposed. His vision at this time was 20/200 without correction, and 20/50 with a + 7.00 D. No. 4, J. could be seen with + 10.00 D. The ophthalmometer showed 2.00 D. of astigmatism, which glasses did not verify.

The fields, of vision and of color, were normal, as shown in chart No. 1. Vision in the periphery of the field was also normal. The 1/200 zone, extending to about forty degrees. He was satisfied with what he saw without glasses, and could not be prevailed upon to get or use them.

The ophthalmoscope showed nothing unusual.

Mr. P. went home, and quickly learned to work by eyesight, so much to his satisfaction that he returned to have the other eye operated upon one year later. He said he could see anything he wanted, but was unable to judge of distance, and that in some forms of work, where distance had to be considered — as in chopping wood — he could do better with his eye closed.

His remarkable sense of location and direction, and his keen sense of touch, had been largely lost, and he could no longer tell colors by feeling, with accuracy.

I operated on the right eye, and found the same conditions, and met with the same success, as on the left. Ten days later, when he was first allowed to see with this eye, it was found that he could see and use it as readily as he had done with the other. He was then allowed to look around with both eyes open, and said he saw comfortably and better than he had ever done. Both eyes acted in perfect harmony, and there was no diplopia; but a prism of 5 degrees base, in either direction, before either eye, caused double images. With a stereoscopic picture, in which two separated semi-circles are made to appear as a circle when viewed through the instrument by a normal pair of eyes, he saw only the circle — showing perfect binocular vision. The eye was bandaged up, and two days later it was removed and the muscular condition of his eyes was found to be as follows, for twenty feet: Orthophoria; abduction 2 degrees; adduction 4 degrees; sersumduction 1 degree; deorsumduction 1 degree. The condition was practically the same for fourteen inches.

He volunteered the statement that he could estimate distances with much more accuracy and ease; and when told to quickly touch the point of a pencil, held in front of him, with his finger, he did so with precision when both eyes were open, but usually missed when either eye was closed, or alone dependent upon.

Three weeks later, vision in right, or last eye operated on, 20/200; + 7.00 D., V. = 20/40 + 10.00 D., No. 4, J. at 8 inches. Left eye, vision, 20/200, + 7.00 D., V. = 20/32, + 10.00 D., No. 4, J. + 8 inches. While glasses sharpened his sight, they were uncomfortable, and were gotten under protest, to be later discarded, I learned, because they produced diplopia.

His field for vision and color was normal, as shown in chart No. 2. His excentric vision was also normal. The ophthalmometer showed astigmatism, which lenses did not verify. The ophthalmoscope showed a normal fundus.

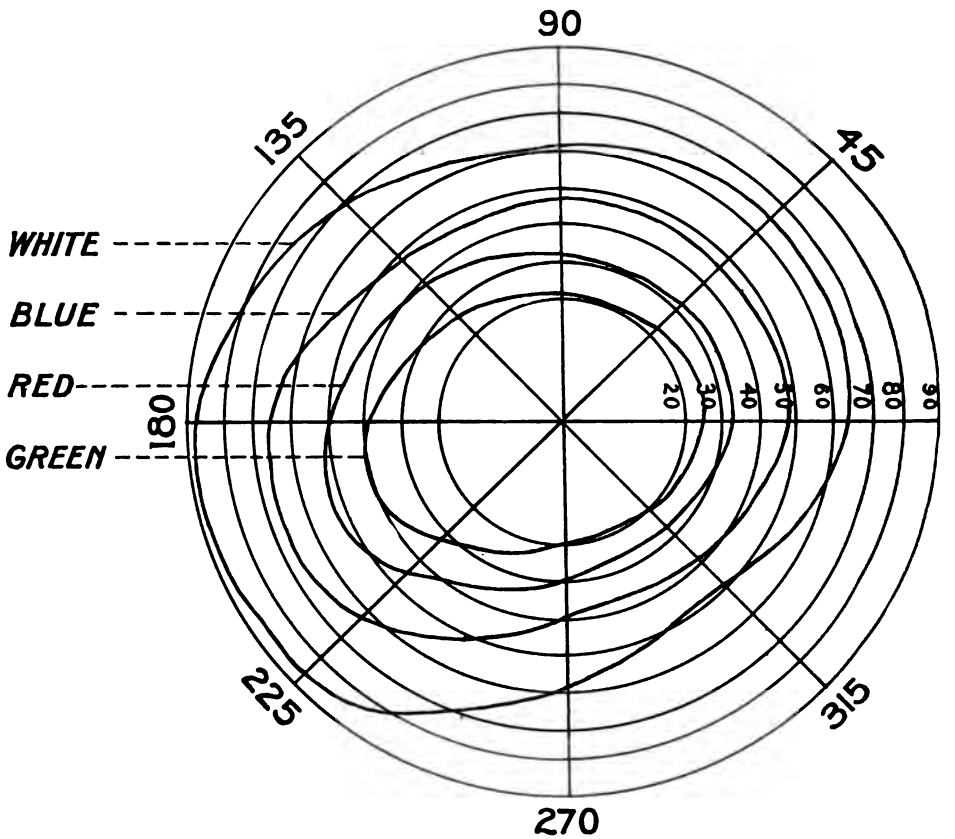
It is stated by Foster, in his work on Physiology, that "if both eyes be removed from a new-born animal, not only do both optic nerves and the greater part of both optic tracts cease, only to be further developed and degenerate, but the two lateral corpora geniculata, the pulvena on each side, and the two anterior quadrigemina do not develop. The development of these nervous structures seems to be largely dependent upon the functional connection with the eyes, by the optic tracts and nerves." And yet this pair of eyes, never depended upon, and forty years old, could see, could distinguish colors, and were possessed of binocular vision, when the first efforts were made in that direction.

It is probable that the perception of light possessed by my patient may have kept these parts intact, but it is difficult to understand how they were ready to assume such perfect functional activity as was noted, if there is really as much in the theory of development being dependent upon functional activity as is currently supposed.

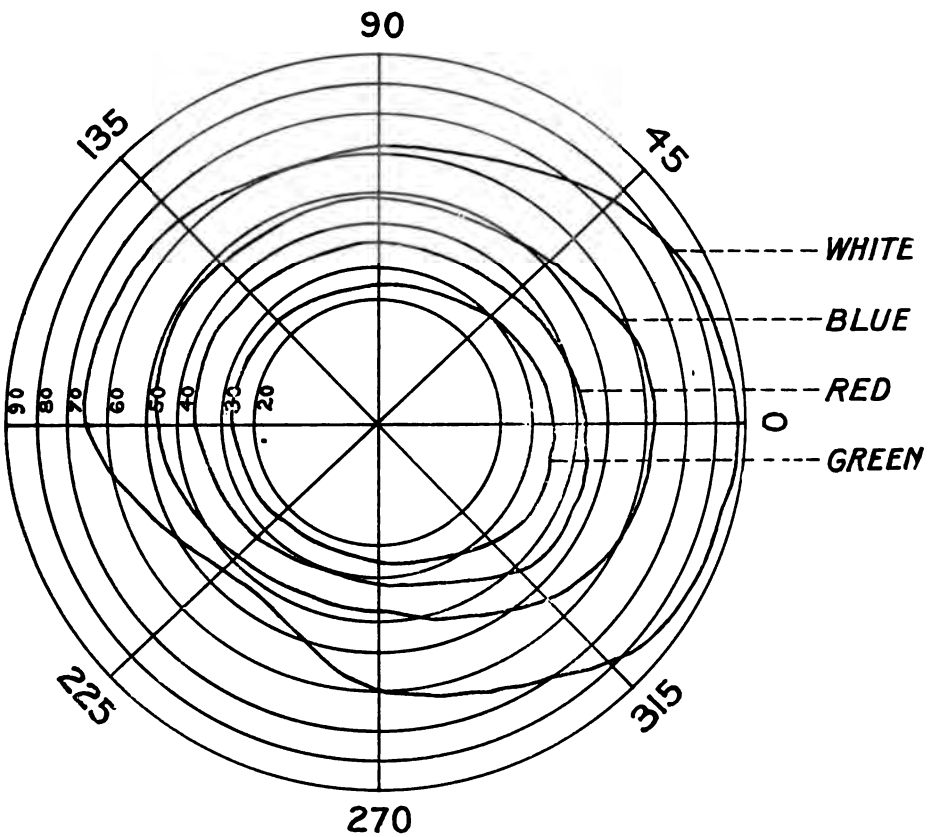
Forster further states that " Donders observed normal binocular movements in an infant one hour old."

Some physiologists claim that we seen things up side down, because inverted images of objects looked at are formed on the retina, and because the lower half of the retina is concerned in seeing things above the horizontal, the left half of the retina objects on the right side of the median line, etc. They say that objects are seen and appear to be up side down, to infants and others, when the function of vision is first exercised, and that only after the sense of touch has been so cultivated as to demonstrate that it gives the real and correct relation of objects do we have things seen appear to us in their natural position and relation by a process called *reinversion*. They say that without the sense of touch things would always appear up side down through the sense of sight; and that if a person possessed of the sense of touch, but

LEFT EYE CHART I.



RIGHT EYE CHART 2



not having nor ever having had that of sight, be made to see, objects seen will appear up side down, until by cultivation this process of reinversion establishes the proper relation between the senses of touch and vision. My patient was in this latter condition, and yet the first object with distinctive shape which he was allowed to see did not appear inverted, but was correctly appreciated (*i. e.*, a glass goblet, the outlines of which he mapped out by movements of the hand before touching); and the first object he saw — the ball — he reached out and touched with little hesitation, though it was two feet off and about 45° *below* the level of his eyes, and the upper half of the retina was concerned in getting his first glance of it.

It seems to me that this is as it should have been, for our sense of direction of an irritant is the same for the retina that it is for any other nerve of the body — it is referred back to the same direction whence it came — opposite the point of impact. For instance, if the fingers be extended, and the hand be held palm upward, and any part of the palm or palmar surface of the fingers be irritated, the force producing it will be recognized as having come from *above*, or if the palm be *down*, the force will have come *up*, etc. Now, if the fingers be curved up somewhat on the palm, so as to make a sort of cup-like cavity, the concavity of which will be the palmar surface of the hand and fingers, the forearm being vertical, the wrist bent back so as to direct the cavity forward, we will have a palmar surface arranged after the manner of the retina. The lower half of the cavity will be the palm of the hand, irritation of which must come from above — the upper half of the cavity, the palmar surface of the fingers, irritation of which must come from below. The retina is just such a cup-shaped nervous expansion with its perceptive elements facing the concave surface; and so it is natural that objects in the field of vision should excite correspondingly opposite portions of the retina, as it is necessary for the inverted image of an object to be formed in that part of the concavity of the retina perceiving it.

These physiologists have fallen into the error of confounding the inverted image of the object formed on the retina — a simple

phenomenon of refraction — which may be visible to an observer, but not the subject with the recognition of the object by the brain and its projection to its proper position in space. And the so-called reinversion of the field of vision differs in no material way from nerve reaction elsewhere.

The fact that my patient had perception of light before he was operated on may be cited as a possible explanation of his correct estimation of the field of vision, but with the explanation that I have given of retinal perception such explanation is unnecessary.

A CASE OF MELANO-SARCOMA OF THE CONJUNCTIVA AND CORNEA, OF LONG DURATION.

BY JOHN GREEN, M.D., AND ARTHUR E. EWING, M.D.,
ST. LOUIS, MO.

The patient, a man 57 years of age, of rather dark complexion, was first seen February 1, 1898. About twenty-five years ago he had noticed a dark brown spot on the left eyeball, beneath the upper lid. A sketch, made by the patient from memory, shows a nearly circular spot, about 4 mm. in diameter, in the conjunctiva and extending about 1 mm. upon the cornea. About nine years ago the growth was noticed to have become somewhat prominent, so that it could be felt through the upper eyelid. For the last three or four months there had been conspicuous protrusion of the upper lid, also occasional slight bleeding from the eye.

On raising the drooping eyelid a large and somewhat irregular black tumor of the eyeball was exposed. It measured 17 mm. vertically, 16 mm. horizontally, and about 8 mm. in height at the most prominent part, involving the conjunctiva oculi for a distance of about 11 mm. from the upper limbus, and extending downwards a little beyond the middle of the cornea, where it appeared to terminate abruptly. The remainder of the cornea was somewhat clouded, so that the texture of the iris was but imperfectly visible through it. Above the tumor there was an irregular

FIG. I.

extension of dark pigmentation in the conjunctiva, for a distance of about 6 mm., and there was an isolated pigmented patch, about 4 mm. in diameter, in the conjunctiva to the temporal side. Above and to both the temporal and the nasal sides, the conjunctival vessels were distended and tortuous, and dark in color. A little dark blood was seen to ooze apparently from the substance of the tumor. The entire growth was covered by a smooth shining membrane, which appeared to be continuous with the conjunctival and corneal epithelium.

A fairly good dilatation of the previously nearly hidden pupil was obtained from a single instillation of a ½ per cent. solution of atropia, after which the ophthalmoscope showed a good red reflex from all parts of the fundus. V = 5/LX.

On February 6th the eyeball was enucleated, together with so much of the conjunctiva as appeared to be involved. The healing was normal, and the wearing of an artificial eye was begun after the tenth day. The cosmetic result was very satisfactory, and there has been no sign of recurrence [after ten months].

Immediately upon its enucleation, the globe was placed in a 5 per cent. formol solution. After hardening, it was frozen, and bisected vertically through the tumor. The nasal half of the eye was then carried through weaker into stronger alcohol, and later into absolute alcohol. It was imbedded in celloidine, and cut on the large (Thoma) microtome.

The sections (Fig. I) show an entirely normal globe, except where the conjunctiva oculi and the cornea, the latter for the most part anteriorly to Bowman's membrane, are involved in the morbid process. Nowhere is the deeper subconjunctival tissue invaded, and the sclera shows no sign of pathological deposit. In an area about 4 mm. in diameter, half way between the middle of the cornea and the upper limbus, Bowman's membrane is in great part destroyed, and the corneal tissue proper superficially attacked. In this region bands of spindle-cell tissue are seen to radiate from the cornea into the tumor in all directions, interlacing in such a way as to present, under low powers, a coarsely alveolated appearance. Within these alveoli are aggregations of

pigmented cells (Fig. IV), which are blackest and most numerous in the deeper portions of the tumor, where the alveoli are best defined and where are also many apparently abandoned blood vessels with black walls.

In the peripheral and more superficial portions of the tumor, where the alveoli are not well defined, are everywhere irregular spaces crowded with large poorly pigmented cells, many of which are quite unpigmented, some round, some elongated, some with well-defined nuclei, others without definable nuclei.

The conjunctival portion of the tumor is filled with large thin-walled blood vessels, together with numerous collections of extravasated blood.

The stroma of the tumor is largely made up of spindle cells, but there are everywhere round or roundish pigmented cells scattered throughout its mass, together with other large roundish nucleated cells with clear outlines, suggesting epithelial cells. In the epithelial layer, which everywhere covers the tumor, and which is continuous with the epithelium of the conjunctiva and cornea, there are comparatively few pigmented cells, whereas in the pigmented patches in the conjunctiva, beyond the limits of the tumor proper, the pigment is wholly in the epithelial layer.

Below the middle of the cornea the tumor drops off suddenly in thickness, but it continues downwards, as a thin and progressively diminishing layer, over fully one-half of the remaining corneal area (Figs. I, II, and III). This is evidently the region where the corneal portion of the growth is actively advancing, and it is here that the selected track of invasion, between the corneal epithelium and Bowman's membrane, is clearly seen.

The specimen is interesting as an example of a melano-sarcoma, long neglected and of large size, which, nevertheless, has only slightly attacked the corneal tissue proper, through Bowman's membrane. Its origin was evidently from an old pigmented patch in the conjunctiva, at the sclero-corneal border: had it come under observation earlier, it could probably have been completely removed without sacrificing the eye.

FIG. II.

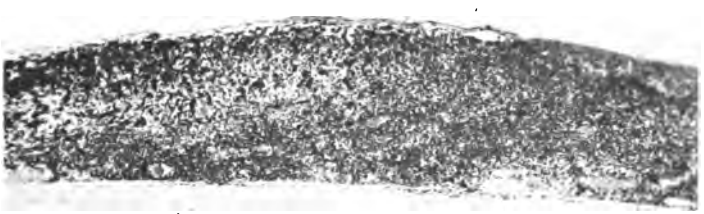


FIG. III.

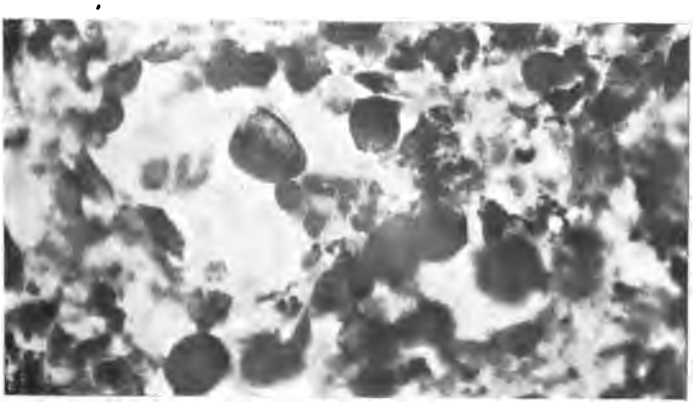
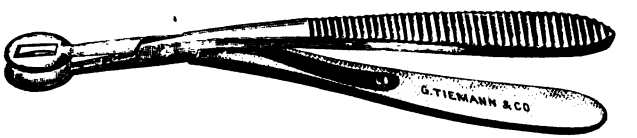


FIG. IV.

EXHIBITION OF CHALAZION FORCEPS.

DR. C. J. KIPP,
NEWARK.

I have used these forceps with advantage in chalaziac of moderate hardness. It is a simple forceps, one blade of which is



solid and the other has a slit in it. I place the solid blade on the skin and the slit over the conjunctiva, evert the lid and make an incision through this slit. The moment I complete the incision I compress the handle and press out the contents of the cyst. This is sufficient without any curetting. I have used it for four years and find it to be very useful.

DISCUSSION.

DR. H. W. RING. — Have you any complaint on the part of the patient from the pressure necessarily made?

DR. KIPP. — Yes. They do complain, but the pain is not as great as from curetting.

TRANSACTIONS

OF THE

AMERICAN

OPHTHALMOLOGICAL SOCIETY.

Thirty-fifth Annual Meeting.

NEW LONDON, CONN., 1899.

HARTFORD:
PUBLISHED BY THE SOCIETY.
1899.

Press of The Case, Lockwood & Brainard Company

TABLE OF CONTENTS.

PAGE.

Members of the society, ... 469
Minutes of the thirty-fifth annual meeting, ... 473
Anomalies of the epithelial layer of the crystalline lens and anterior polar cataract, by Dr. A. Alt, ... 478
Sympathetic ophthalmia caused by glioma-retinae, by Dr. A. Alt, . 485
Case of spontaneous rupture of the eyeball, by Dr. B. L. Millikin, . 488
Description of the reflecting phorometer and a discussion of the possibilities concerning torsion of the eyes, by Dr. F. H. Verhoeff, ... 490
Congenitally inefficient external rectus with binocular vision, by Dr. J. O. Tansley, ... 503
Cyst of the vitreous, by Dr. J. O. Tansley, ... 507
Case of primary tumor of the optic nerve, by Dr. F. Buller, . . 510
Case of primary non-pigmented sarcoma of the upper lid, by Dr. C. A. Veasey, ... 519
Case of expulsive intra-ocular hemorrhage after preliminary iridectomy for cataract, by Dr. R. L. Randolph, ... 522
Retinitis albuminurica as a factor in the causation of secondary glaucoma, by Dr. C. S. Bull, ... 526
Cases of metastatic panophthalmitis, by Dr. B. L. Millikin, . . 535
Multiple rupture of the pupillary border of the iris with subsequent development of myopic astigmatism, by Dr. W. F. Mittendorf, 541
A communication upon acoin, a new local anesthetic, by Dr. R. L. Randolph, ... 544
More uniform tests for vision, color-sense, and hearing, by Dr. C. H. Williams, ... 547
Double needle intended to facilitate the discission of secondary cataract, by Dr. F. Buller, ... 563
A modified perimeter, by Dr. C. H. Williams, ... 567
A method of converting the alternating current for use in connection with the Johnson magnet, by Dr. W. B. Johnson, . . . 570
Report of three cases of magnetic extraction of steel from the eyeball through the point of entrance, by Dr. W. B. Johnson, . 571
Clinical measurements of pupilary reaction, by Dr. L. Howe, . . 577
Is there a "hypermetropia acquisita," by Dr. B. A. Randall, . . 583
Modification of the stereoscope, by Dr. R. H. Derby, . . . 587
In memoriam, Dr. J. J. B. Vermyne, ... 591

MEMBERS

OF THE

American Ophthalmological Society.

1899-1900.

ACTIVE MEMBERS.

The (*) indicates *Associate* Members.

NAME.	RESIDENCE.	PLACE.
Dr. F. W. ABBOT,	523 Franklin Street,	Buffalo, N. Y.
Dr. A. E. ADAMS,	44 Grand Street,	Newburg, N. Y.
Dr. WM. F. AIKEN,	228 Oglethorpe Ave. E.	Savannah, Ga.
Dr. L. A. W. ALLEMAN,	64 Montague Street,	Brooklyn, N. Y.
*Dr. A. ALLING,	199 York Street,	New Haven, Conn.
*Dr. G. W. ALLYN,	515 Penn Avenue,	Pittsburg, Pa.
Dr. A. ALT,	3036 Locust Street,	St. Louis, Mo.
†Dr. J. A. ANDREWS,	107 Madison Avenue,	New York, N. Y.
Dr. S. C. AYRES,	14th East 7th Street,	Cincinnati, Ohio.
Dr. WM. T. BACON,	11 Pratt Street,	Hartford, Conn.
Dr. DAVID DEBECK,	Cor. 9th and Race Streets,	Cincinnati, Ohio.
Dr. H. W. BRADFORD,		Jamaica Plain, Mass.
Dr. CHARLES S. BULL,	47 West 36th Street,	New York, N. Y.
Dr. F. BULLER	123 Stanley Street,	Montreal, Canada.
Dr. SWAN M. BURNETT,	916 Farragut Sq. (17th St.),	Washington, D. C.
Dr. PETER A. CALLAN,	35 West 38th Street,	New York, N. Y.
Dr. F. P. CAPRON,	118 Angell Street,	Providence, R. I.
Dr. W. H. CARMALT,	87 Elm Street,	New Haven, Conn.
*Dr. JOHN T. CARPENTER, JR.,	1419 Walnut Street,	Philadelphia, Pa.
Dr. H. B. CHANDLER,	34½ Beacon Street,	Boston, Mass.
Dr. WM. CHEATHAM,	303 West Chestnut Street,	Louisville, Ky.
Dr. F. E. CHENEY,	Hotel Bristol,	Boston, Mass.
*Dr. J. H. CLAIBORNE,	39 West 36th Street,	New York City.
Dr. C. F. CLARK,	188 East State Street,	Columbus, Ohio.
*Dr. ANTON COE,	1110 F. St.,	Washington, D. C.
Dr. DAVID COGGIN,	7 Chestnut Street,	Salem, Mass.
*Dr. WM. E. COWEN,	35 E. 60th Street,	New York, N. Y.
Dr. C. M. CULVER,	36 Eagle Street,	Albany, N. Y.
Dr. W. S. DENNETT,	8 East 49th Street,	New York, N. Y.
Dr. HASKET DERBY,	182 Marlboro Street,	Boston, Mass.
Dr. RICHARD H. DERBY,	9 West 35th Street,	New York, N. Y.
Dr. LEWIS S. DIXON,	232 Clarendon Street,	Boston, Mass.
Dr. J. B. EMERSON,	20 East 30th Street,	New York, N. Y.
Dr. ARTHUR E. EWING,	2670 Washington Avenue,	St. Louis, Mo.

† Temporarily residing at Pasadena, Cal.

NAME.	RESIDENCE.	PLACE.
*Dr. T. H. FENTON,	1319 Spruce Street,	Philadelphia, Pa.
Dr. GEORGE F. FISKE,	100 State Street,	Chicago, Ill.
Dr. EDW. FRIDENBERG,	242 Lenox Avenue,	New York, N. Y.
Dr. H. FRIEDENWALD,	1029 Madison Ave.,	Baltimore, Md.
Dr. B. F. FRYER,	Cor. 9th and Cherry Streets,	Kansas City, Mo.
*Dr. G. M. GOULD,	119 South 17th Street,	Philadelphia, Pa.
*Dr. H. Y. GRANT,	414 Delaware Avenue,	Buffalo, N. Y.
Dr. JOHN GREEN,	2670 Washington Avenue,	St. Louis, Mo.
Dr. EMIL GRUENING,	109 East 23d Street,	New York, N. Y.
Dr. G. W. HALE,	Wilcox Building,	Nashville, Tenn.
*Dr. WM. D. HALL,	387 Boylston Street,	Boston, Mass.
Dr. H. F. HANSELL,	254 South 16th Street,	Philadelphia, Pa.
Dr. GEORGE C. HARLAN,	1515 Walnut Street,	Philadelphia, Pa.
Dr. DAVID HARROWER,	9 Elm Street,	Worcester, Mass.
Dr. GUSTAVUS HAY,	383 Marlborough Street,	Boston, Mass.
Dr. NEIL J. HEPBURN,	369 West 23d Street,	New York, N. Y.
*Dr. WARD HOLDEN,	49 West 39th Street,	New York, N. Y.
Dr. E. E. HOLT,	723 Congress Street,	Portland, Me.
Dr. LUCIEN HOWE,	87 West Huron Street,	Buffalo, N. Y.
Dr. A. A. HUBBELL,	212 Franklin Street,	Buffalo, N. Y.
Dr. D. W. HUNTER,	233 Madison Avenue,	New York, N. Y.
*Dr. J. W. INGALLS,	848 Lafayette Avenue,	Brooklyn, N. Y.
*Dr. E. E. JACK,	215 Beacon Street,	Boston, Mass.
Dr. EDWARD JACKSON,	McPhee Building,	Denver, Col.
Dr. B. JOY JEFFRIES,	15 Chestnut St., Beacon Hill,	Boston, Mass.
Dr. W. B. JOHNSON,	170 Broadway,	Paterson, N. J.
Dr. CHARLES J. KIPP,	534 Broad Street,	Newark, N. J.
Dr. H. KNAPP,	26 West 40th Street,	New York, N. Y.
Dr. CARL KOLLER,	715 Madison Avenue,	New York, N. Y.
Dr. CHAS. W. KOLLOCK,	Cor. Wentworth & Com'g Sts.,	Charleston, S. C.
Dr. W. E. LAMBERT,	8 West 35th Street,	New York, N. Y.
*Dr. F. N. LEWIS,	35 W. 36th Street,	New York City.
Dr. J. A. LIPPINCOTT,,	435 Penn Avenue,	Pittsburg, Pa.
Dr. F. B. LORING,	1420 K. Street,	Washington, D. C.
*Dr. D. B. LOVELL,	32 Pearl Street,	Worcester, Mass.
Dr. F. W. MARLOW,	731 University Block,	Syracuse, N. Y.
Dr. W. V. MARMION,	1110 8th Street, N. W.,	Washington, D. C.
*Dr. W. B. MARPLE,	35 W. 53d Street,	New York, N. Y.
Dr. ARTHUR MATHEWSON,	139 Montague Street,	Brooklyn, N. Y.
Dr. S. F. MCFARLAND,	76 Front Street,	Binghamton, N. Y.
Dr. CHAS. H. MCILWAINE,	264 Willis Avenue,	New York, N. Y.
Dr. R. J. MCKAY,	Cor. 9th and Market Streets,	Wilmington, Del.
Dr. C. S. MERRILL,	23 Washington Avenue,	Albany, N. Y.
Dr. B. L. MILLIKIN,	278 Prospect Street,	Cleveland, Ohio.
Dr. H. G. MILLER,	262 Benefit Street,	Providence, R. I.
Dr. J. LANCELOT MINOR,	14 Randolph Building,	Memphis, Tenn.
Dr. W. F. MITTENDORF,	140 Madison Avenue,	New York, N. Y.
Dr. WM. O. MOORE,	42 East 29th Street,	New York, N. Y.

NAME.	RESIDENCE.	PLACE.
Dr. RUSSELL MURDOCH,	418 Cathedral Street,	Baltimore, Md.
Dr. WM. F. NORRIS,	1530 Locust Street,	Philadelphia, Pa.
Dr. HENRY D. NOYES,	233 Madison Avenue,	New York, N. Y.
Dr. CHARLES A. OLIVER,	1507 Locust Street,	Philadelphia, Pa.
Dr. H. S. OPPENHEIMER,	16 E. 32d Street,	New York, N. Y.
*Dr. R. J. PHILLIPS,	123 So. 39th Street,	Philadelphia, Pa.
Dr. THOMAS R. POOLEY,	107 Madison Avenue,	New York, N. Y.
*Dr. WILLIAM C. POSEY,	1831 Chestnut Street,	Philadelphia, Pa.
Dr. M. H. POST,	Beaum't St., cor. Wash. Av.,	St. Louis, Mo.
Dr. H. R. PRICE,	485 Franklin Avenue,	Brooklyn, N. Y.
Dr. J S. PROUT,	26 Schermerhorn Street,	Brooklyn, N, Y.
Dr. B. ALEX'R RANDALL,	1604 Walnut Street,	Philadelphia, Pa.
Dr. R. L. RANDOLPH,	816 Park Avenue,	Baltimore, Md.
Dr. WILLIAM RANKIN,	23 Cedar Street,	Newark, N. J.
Dr. J. M. RAY,	423 West Chestnut Street,	Louisville, Ky.
Dr. R. A. REEVE,	22 Shuter Street,	Toronto, Canada.
*Dr. H. O. REIK,	5 W. Preston Street,	Baltimore, Md.
Dr. STEPHEN O. RICHEY,	732 17th Street,	Washington, D. C.
Dr. CHARLES E. RIDER,	53 South Fitzhugh Street,	Rochester, N. Y.
Dr. WHEELOCK RIDER,	53 South Fitzhugh Street,	Rochester, N. Y.
Dr. H. W. RING,	46 Elm Street,	New Haven, Conn.
Dr. SAMUEL D. RISLEY,	1722 Walnut Street,	Philadelphia, Pa.
Dr. EDMUND C. RIVERS,	16th and Stout Streets,	Denver City, Col.
Dr. D. B. ST. JOHN ROOSA,	20 East 30th Street.	New York, N. Y.
*Dr. DUNBAR ROY,	Grand Opera House Block,	Atlanta, Ga.
Dr. JOHN D. RUSHMORE,	129 Montague Street,	Brooklyn, N. Y.
Dr. ROBERT SATTLER,	7th and Race Streets,	Cincinnati, Ohio.
*Dr. T. B. SCHNEIDEMAN,	112 South 18th Street,	Philadelphia, Pa.
Dr. G. E. DESCHWEINITZ,	1401 Locust Street,	Philadelphia, Pa.
Dr. P. N. K. SCHWENK,	810 North 7th Street,	Philadelphia, Pa.
Dr. W. W. SEELEY, '	4th Street and Broadway,	Cincinnati, Ohio.
Dr. HENRY L. SHAW,	19 Commonwealth Avenue,	Boston, Mass.
*Dr. F. D. SKEEL,	58 E. 25th Street,	New York, N. Y.
Dr. J. A. SPALDING,	627 Congress Street,	Portland, Me.
Dr. FRANCIS P. SPRAGUE,	229 Commonwealth Avenue,	Boston, Mass.
Dr. MYLES STANDISH,	6 St. James Avenue,	Boston, Mass.
Dr. GEORGE T. STEVENS,	33 West 33d Street,	New York, N. Y.
Dr. SAMUEL B. ST. JOHN,	68 Pratt St.,	Hartford, Conn.
Dr. GEO. STRAWBRIDGE,	202 So. 15th Street,	Philadelphia, Pa.
Dr. T. Y. SUTPHEN,	999 Broad Street,	Newark, N. J.
Dr. J. OSCROFT TANSLEY,	28 West 43d Street,	New York, N. Y.
Dr. LEWIS H. TAYLOR,	41 South Franklin Street,	Wilkes Barre, Pa.
Dr. SAMUEL THEOBALD,	304 West Monument Street,	Baltimore, Md.
Dr. CH. HERMON THOMAS,	1907 Chestnut Street,	Philadelphia, Pa.
*Dr. A. G. THOMSON,	1426 Walnut Street,	Philadelphia, Pa.
Dr. WILLIAM THOMSON,	1426 Walnut Street,	Philadelphia, Pa.
*Dr. JAS. THORINGTON,	120 South 18th Street,	Philadelphia, Pa.
Dr. JOHN VAN DUYN,	111 South Salina Street,	Syracuse, N. Y.

NAME.	RESIDENCE.	PLACE.
*Dr. C. A. VEASEY,	116 South 19th Street,	Philadelphia, Pa.
Dr. O. F. WADSWORTH,	526 Beacon Street,	Boston, Mass.
Dr. LEROY P. WALKER,	25 East 24th Street,	New York, N. Y.
Dr. DAVID WEBSTER,	327 Madison Avenue,	New York, N. Y.
Dr. J. E. WEEKS,	154 Madison Avenue,	New York, N. Y.
Dr. J. A. WHITE,,	200 E. Franklin Street,	Richmond, Va.
*Dr. W. H. WILDER,	103 State Street,	Chicago, Ill.
Dr. CHAS. H. WILLIAMS,	15 Arlington Street,	Boston, Mass.
Dr. WM. H. WILMER,	1610 I Street, N. W.,	Washington, D. C.
Dr. F. M. WILSON,	288 Myrtle Avenue,	Bridgeport, Conn.
*Dr. WILLIAM L. WOOD,	412 Oregonian Building,	Portland, Oregon.
Dr. J. P. WORRELL,	20 South 7th Street,	Terre Haute, Ind.
Total, ...		142

HONORARY MEMBERS.

Dr. C. SCHWEIGGER, ...	Berlin, Prussia.
Dr. E. L. HOLMES, ...	Chicago, Ill.
Whole number, ...	144

MINUTES OF THE PROCEEDINGS.

THIRTY-FIFTH ANNUAL MEETING.

PEQUOT HOUSE,
NEW LONDON, July 19, 1899.

The Thirty-fifth Annual meeting of the Society was called to order by the President, Dr. O. F. WADSWORTH, at 10 A. M. The President announced the following committees:

Committee on Bulletin — Drs. J. B. EMERSON and W. B. MARPLE.

Committee on Membership — Drs. JOHN GREEN, GEO. C. HARLAN, W. H. CARMALT, C. S. BULL, and E. GRUENING.

Auditing Committee — Dr. B. F. FRYER.

The Committee on Bulletin reported and the following papers were read.

1. "An office Stereoscope," Dr. R. H. Derby.

2. "A description of the Reflecting Phorometer and a discussion of the possibilities concerning Torsion of the eyes," by Dr. F. H. Verhoeff of Baltimore. (By invitation of the Society.)

3. "Congenitally inefficient External rectus and binocular vision," Dr. J. O. Tansley.

Drs. G. L. Holmes, New Britain, Conn.; G. W. Ellis, Munson, Mass.; Edw. Swasey, Worcester, Mass.; J. B. Lovell, Worcester, Mass.; H. S. Miles, Bridgeport, Conn., and A. Peck of Norwich, Conn., were invited to attend the sessions and take part in the discussions.

4. "A case of primary Tumor of the optic nerve," Dr. F. Buller.

5. "A case of primary, non-pigmented Sarcoma of the upper lid," Dr. C. A. Veasey.

Discussed by Drs. Reeve, Alt, and Buller.

6. "An instrument to facilitate the operation of Capsulotomy," Dr. F. Buller.

7. "A case of expulsive intra-ocular Hemorrhage after preliminary iridectomy for cataract," Dr. R. L. Randolph.

Discussed by Drs. Fryer, Sutphen, Carmalt, Randolph, Millikin, Randall, Reeve, and Wadsworth.

8. "Retinitis Albuminurica as a factor in secondary glaucoma," Dr. C. S. Bull.

Discussed by Drs. Prout, Wadsworth, Howe, and Mittendorf.

9. "On anomalies in the epithelial layer of the Crystalline Lens and anterior polar Cataract," Dr. A. Alt.

10. "A method of converting the alternating electrical current for use in connection with the Johnson Magnet," Dr. W. B. Johnson.

11. "Report of three cases of Magnetic Extraction of steel from the Eye through point of entrance," Dr. W. B. Joshson.

Discussed by Drs. Howe, W. Rider, Holt, Johnson, and Harlan.

12. "Cyst of the Vitreous (with patient)," Dr. J. O. Tansley.

Discussed by Drs. Alt and Randall.

13. "A case of Sympathetic Ophthalmia due to Glioma Retinæ in the fellow eye," Dr. A. Alt.

14. "Cases of Metastatic Panophthalmitis," Dr. B. L. Millikin.

Discussed by Drs. Fryer, Sutphen, Randolph, Randall, Alt, and Wadsworth.

15. "Case of spontaneous rupture of eyeball," Dr. B. L. Millikin.

Adjourned to 3 P. M.

Called to order at 3 P. M.

16. "Multiple rupture of sphincter of iris, with subsequent development of Myopic Astigmatism," Dr. W. F. Mittendorf.

Discussed by Drs. Randall and Harlan.

Dr. W. P. Eagleton, Newark, N. J., invited to attend sessions and participate in discussion.

17. "Normal Pupillary Reaction, with microscope for its measurement," Dr. L. Howe.

18. "Is there a Hypermetropia Acquisita?" Dr. Randall.

Discussed by Drs. Holt and Ring.

19. "The value of Acoin as a local anesthetic in eye surgery," Dr. Randolph.

Discussed by Dr. Howe.

20. "More uniform tests for Vision, Color-sense, and Hearing," Dr. C. H. Williams.

Discussed by Drs. Standish, Holt, Williams, Culver, Randolph, Mittendorf, Carmalt, Randall, Dennet, Wadsworth, and Holt.

21. "A Modified Perimeter," Dr. C. H. Williams.

The Society then went into Executive Session.

Auditing Committee reported the Treasurer's accounts correct, and the Treasurer's report accepted and ordered on file. Several names were reported as proposed for membership and referred to the Committee on Membership for 1900.

The following gentlemen, having been recommended for election by the Committee on Membership, were balloted for and elected:

Dr. D. B. Lovell, Worcester, Mass.; Dr. A. Alling, New Haven, Conn.; Dr. H. O. Reik, Baltimore, Md.; and Dr. Dunbar Roy, Atlanta, Ga.

The following officers were nominated by the Executive Committee and elected:

President — Dr. O. F. WADSWORTH.

Vice-President — Dr. C. S. BULL.

Corresponding Secretary — Dr. J. S. PROUT.

Recording Secretary and Treasurer — Dr. S. B. ST. JOHN.

Publishing Committee — Dr. W. S. DENNETT, R. H. DERBY, and the Secretary (*ex officio*).

The President announced that the Business Committee for the ensuing year would be Drs. Jno. Green, C. S. Bull, S. Theobald, Arthur Mathewson, and W. H. Carmalt.

Dr. Prout offered the following amendment to the By-Laws, to "strike out 3d section of Art. I," which reads as follows: "A vote of three-fourths of the members present at an annual meeting shall be requisite to election. The election shall be by ballot," and substitute the following: "Names of candidates for membership reported on favorably by the Committee on Membership, shall be placed on the roll of associate members of the Society, provided, however, that any two members may demand a vote by ballot on any name so reported, in which case a vote of three-fourths of those present at the meeting shall be required to elect." This was laid over for action next year.

Dr. Williams moved that the President appoint a committee of three to consider the question of standards and the best method of making examinations for acuteness of vision, color-sense, and hearing, and that they be requested to report at the annual meeting two years hence. The President subsequently appointed Drs. C. H. Williams, Wm. Thomson, and W. S. Dennett.

Voted, That the assessment for next year be five dollars.

Voted, That the Society hold its next annual meeting in the first week of May, 1900, at Washington, D. C., in connection with the Congress of American Physicians and Surgeons.

Adjourned.

S. B. St. JOHN,
Secretary.

Present at the Thirty-fifth Annual Meeting:

Dr. S. B. St. John,
Dr. A. Alt,
Dr. T. B. Schneideman,
Dr. W. L. Wood,
Dr. L. Howe,
Dr. P. N. K. Schwenk,
Dr. C. H. McIlwaine,
Dr. J. B. Emerson,
Dr. R. L. Randolph,
Dr. M. H. Post,
Dr. F. Buller,
Dr. W. Rider,
Dr. W. C. Posey,
Dr. W. B. Johnson,
Dr. C. A. Veasey,
Dr. W. E. Lambert,
Dr. R. A. Reeve,
Dr. C. H. Thomas,
Dr. O. F. Wadsworth,
Dr. W. H. Carmalt,
Dr. W. O. Moore,
Dr. R. H. Derby,
Dr. James Thorington,
Dr. F. P. Capron,
Dr. Wm. Rankin, Jr.,
Dr. F. E. Cheney,
Dr. J. O. Tansley,
Dr. J. W. Ingalls,
Dr. W. V. Marmion,
Dr. W. S. Dennett,
Dr. J. S. Prout,
Dr. G. F. Fiske,
Dr. L. A. W. Alleman,
Dr. G. T. Stevens,
Dr. A. E. Adams,
Dr. N. J. Hepburn,
Dr. J. M. Ray,
Dr. Jno. Green,
Dr. W. B. Marple,
Dr. H. W. Ring,
Dr. C. S. Bull,
Dr. H. B. Chandler,
Dr. G. C. Harlan,
Dr. T. H. Fenton,
Dr. Myles Standish,
Dr. C. M. Culver,
Dr. W. T. Bacon,
Dr. T. Y. Sutphen,
Dr. B. E. Fryer,
Dr. E. E. Holt,
Dr. S. F. McFarland,
Dr. W. F. Mittendorf,
Dr. D. Coggin,
Dr. F. D. Skeel,
Dr. D. W. Hunter,
Dr. B. A. Randall,
Dr. J. D. Rushmore,
Dr. J. H. Claiborne,

ON ANOMALIES OF THE EPITHELIAL LAYER OF THE CRYSTALLINE LENS AND ANTERIOR POLAR CATARACT.

BY ADOLF ALT, M.D.,

ST. LOUIS, MO.

In spite of all theories offered to explain the pathogenesis of anterior polar and pyramidal cataract it is still shrouded in as much mystery as is that of senile cataract. This is no doubt due to the fact, that the initial and earlier stages of the development of these diseases of the lens have been rarely, if ever, seen and studied histologically. Thus the attempts at explanation of their formation are still purely theoretical in character.

From the literature on this subject most of the observers, like Hulke, Becker, Collins, and others, agree on this one point, that a prolonged contact of the anterior lens capsule with the posterior surface of the cornea and the consequent interference with the normal osmotic processes through the capsule, forms the best explanation for the formation of *acquired* anterior polar cataract.

Furthermore, most observers acknowledge a *congenital* form of anterior polar cataract as distinct from the acquired form. Becker alone is strongly inclined to deny the congenital form and to assume, in apparently congenital cases, an intra-uterine perforation of the cornea and contact between this membrane and the lens.

Such a contact between the cornea and lens can, as a rule, without exception, take place only when the aqueous humor has been lost, and this, again, only when the eyeball, more especially the cornea, has been perforated. The most frequent cause for such a perforation is probably an injury to the cornea. Frequently the healing of such a wound is a protracted one and the anterior lens capsule remains in contact with the cornea for

days before an anterior chamber is re-established, and yet, I do not know that the development of an anterior polar cataract from this cause has been observed. Certainly more frequently we see a consecutive *general* cataract developing if the injury leads to pathological changes in the deeper structures of the eye.

That a perforation of the cornea, due to an ulcerating process, may give rise to an anterior polar cataract, is a well-known fact. Yet, how small is the number of cases of ulceration of the cornea in which this takes place, when compared with the large number of cases of corneal ulceration and perforation in which no such sequel has been observed.

We know, furthermore, all of us probably from our own personal observation, that now and then an anterior polar cataract may develop as the result of a blennorrhœa of the conjunctiva, or a keratitis, without a perforation of the cornea. The formation of anterior polar cataract in such cases is explained by Hulke in the following words:

"In ophthalmia neonatorum, when the cornea has become inflamed and swollen, its posterior surface may actually come in contact with the front of the lens, and then a dot of lymph poured out upon the latter by the inflamed cornea, or even the mere pressure contact, may give rise to opacity by preventing the proper nutritional osmosis through the capsule; the little white cones which seem to project forward through the pupil in cataracta pyramidata, have their origin in this way."

I cannot imagine that a cornea ever swells up so much in a backward direction that it could come in contact, let alone press upon the lens; nor can we exactly understand how the pouring out of a dot of lymph from the inflamed, but otherwise intact, cornea can take place. Such occurrences have probably never been seen, and appear to be purely theoretical assumptions.

Hutchinson's criticism of Hulke's theory has more recently been further elaborated by Nuel, who gives his theory as follows: "In the newly-born, especially during a blennorrhœa, the pupil is very small, really only about 1mm. in diameter.

It follows, that just to that extent and corresponding to the shape of the pupil the anterior lens capsule is not protected against the afflux of phlogogenic substances by the iris, and this is exactly the place where, later on, the anterior polar cataract is located."

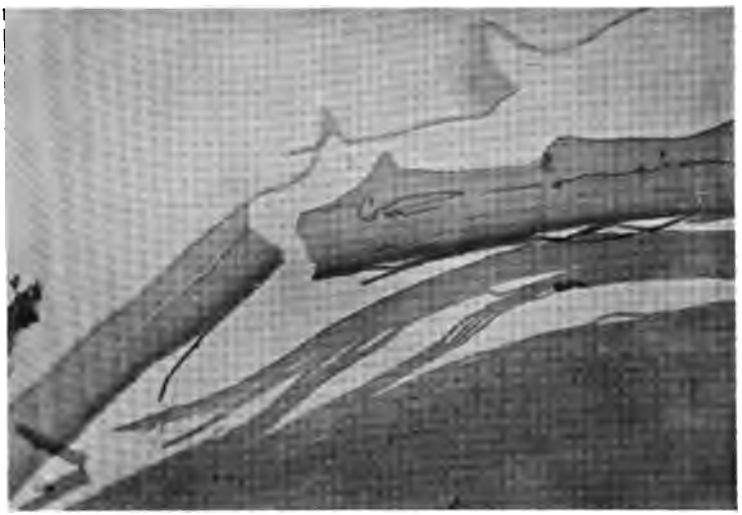
That later in life non-perforating ulcers of the cornea do not cause the formation of an anterior polar cataract, in his opinion, is due to the fact, that the capsular epithelial cells have arrived at a state of relative rest and are less apt to react by proliferation on similar existing causes. When, however, the lens is bathed in pus, or when the lens, for a prolonged period, comes in contact with a cornea which is infiltrated with pus, even in the adult the resulting irritation may be sufficient to cause the formation of an anterior polar cataract.

He also assumes, that when a perforation of the cornea occurs during a blennorrhœa of the conjunctiva, even then the diffusion of these phlogogenic substances into the crystalline lens is the real cause of the subsequent anterior polar cataract.

It seems to me, that contact between the anterior lens capsule and the posterior surface of the cornea, whether this membrane be otherwise healthy, or infiltrated with pus, even if it be prolonged, cannot alone be the cause of the formation of an anterior polar cataract. If it was, it should occur at least now and then after a perforating injury of the cornea, and with more frequency and regularity after ulcerative perforation of this membrane.

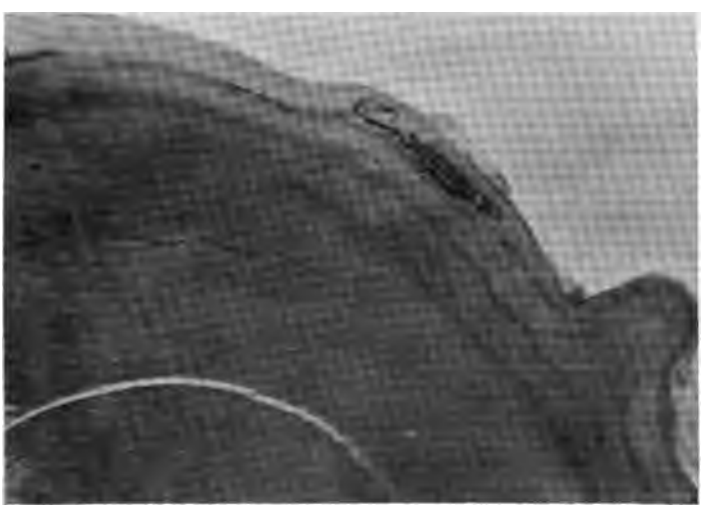
Nuel's explanation of the occurrence of anterior polar cataract after blennorrhœa, of the conjunctiva without corneal ulcerative perforation, by the influence of the phlogogenic substances on the part of the lens capsule exposed to them and corresponding in area with the infantile pupil, cannot probably be perfectly correct in all cases, otherwise the opacity should always lie centrally, while in reality it is more frequently found to be situated excentrically.

All of these theories deal with the acquired polar cataracts. What of the congenital one? Must we accept Becker's theory



1. Anterior Aspect of Crystalline Lens.

Capsule detached by manipulation. The capsular epithelium forming the dark, wavy, and broken line is separated from the capsule by a homogeneous substance.



2.

Peculiar convolutions of capsular epithelium a considerable distance in front of the æquator.

of an intra-uterine corneal perforation? Surely we cannot do so in cases in which several members of a family — as, for instance, the father and several children, are born with anterior polar cataracts, and I know several such families from my own observation. If I remember right, Dr. J. Green reported quite a number of such cases in one family. I have also observed several times a lamellar cataract in one and an anterior polar cataract in another child of the same family, where there was no blennorrhœa, nor keratitis. There is then, surely, a congenital malformation of the lens appearing as an anterior polar cataract, which may even be transmitted by heredity.

This fact, then, seems to give us a clew to a missing factor in the causation and pathogenesis of anterior polar cataract in the so-called acquired form. At the same time, it seems, this will give us an explanation of why, under, as far as we can judge, very similar or even like circumstances an anterior polar cataract will develop in one case and not in another.

I mean by this, that it seems to me that for an explanation of this fact we have, in all probability, to fall back on some congenital malformation in the lens which, perhaps, in combination with the suspension of osmosis by contact between the cornea and lens (Hulke), or with the penetration of phlogogenic substances through a perforated or intact cornea into the lens (Nuel), may bring about the formation of an anterior polar cataract. This would, of course, not exclude the possibility of the development of an anterior polar cataract from the pre-existing malformation even without the agency of the other theoretically assumed factors.

In looking through the literature on this subject I have not been able to find any observations of such congenital malformations. I have been fortunate enough, however, in the course of my microscopical studies to find four eyes from two adult male individuals which seem to furnish such a missing link.

Having obtained these eyes from the dissecting rooms, I know nothing of their history. All of them showed a dimness

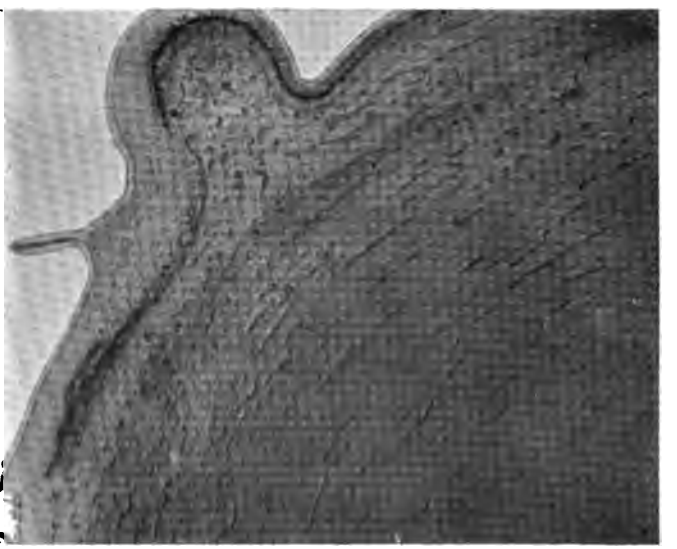
of the anterior lens surface when the cornea was removed, one of them, besides, a small pyramidal cataract. The eyes were removed as soon as the bodies had been obtained and preserved in a five per cent. formol solution, afterwards hardened in alcohol and cut into sections after embedding in celloidin. That is, they were treated exactly like a great many other eyes which showed no similar conditions, which may be taken as proof that the hardening process did not produce these conditions, a suspicion which, I confess, at first arose in my mind.

The four lenses showed such a similarity of abnormal conditions, that it is unnecessary to describe each one separately.

Instead of forming the usual single and uninterrupted layer of cells lying closely in contact with and lining the anterior lens capsule and farther back to where the young lens fibers are formed, in these lenses these cells are very irregularly arranged. In parts they are separated for a lesser or greater distance from the lens capsule by a transparent, homogeneous or finely granular substance; sometimes this substance lies as well in front as behind the cells. In other sections whole portions of the cells lie closely applied to the lens-capsule, while smaller portions are separated from it. Sometimes there is an almost normal lining to the capsule, while one or more rows of cells run more or less parallel to it farther back. In a large number of sections these detached cells have evidently proliferated, yet not promiscuously in all directions, but in such a manner that their nuclei form a continuous chain which, however, probably from the limitation of space and the obstacles encountered, has been forced to form the queerest reduplications and convolutions, wavy and even spiral lines and hooks.

This abnormal and irregular arrangement of the capsular epithelium is in the different sections seen to affect all its parts, as far back even as to where the lens fibers start. In a number of sections isolated cell-convolutions are found even farther back on the inner surface of the posterior lens capsule.

In most of the sections the lens capsule has numerous folds. Where such a fold appears near the equator the detached epithelium runs usually parallel with it, while, where the folds lie near



3.

Capsular epithelium separated from capsule by a homogeneous substance and proliferated.

4.

Peculiar convolutions of capsular epithelium in front of æquator.

or at the anterior pole, the epithelial layer often appears as if torn apart. This latter condition might, perhaps, be due to a shrinking of the homogenous substance during the hardening process, if it was, during life, of a semi-fluid consistency.

Interesting as all the lenses are, the one which showed a pyramidal cataract is, perhaps, the most interesting. In the cornea of this eye the scar of a former perforation was distinctly visible. All the sections of this lens, which do not include the pyramidal cataract, differ in no particular from those just described. In the sections going through the small pyramidal cataract the teat-like projection of the capsule is filled with a more or less granular substance which, at the base of the cone, shows undoubted evidence of the beginning of the appearance of amorphous lime. In the cone itself no epithelium lines the capsule, neither is there any epithelium visible at the base of the cone, as is often found in older cases of pyramidal cataract. But within the substance filling the cone are several convolutions of epithelial cells which take the stain but very imperfectly and are evidently disintegrating.

Like E. T. Collins, who reported thirteen cases, I have had occasion to examine quite a number of lenses with pyramidal cataract, but evidently he has not, neither have I, before this seen cases in such an early, almost the initial, stage.

The abnormal arrangement of the capsular epithelium in these four lenses, I am inclined to look upon as probably a congenital malformation which, other factors having been added by the perforation of the cornea, in the one lens has led to the beginning of a pyramidal cataract. In assuming this explanation to be correct, I must, of course, part with the opinion which, with others, I hitherto held, that the lens capsule is probably formed by the capsular epithelium.

If from these few new observations I may be permitted to add a new theory to those already promulgated, in order to explain the formation of an anterior polar cataract, I would state that the prime cause probably is a congenital malformation of the lens. This malformation represents a break or breaks in the continuity of the capsular epithelium layer as well as a dissolution

of contact between this layer and the lens capsule. With such a pre-existing anomaly the lens capsule would be in the same condition as Descemet's membrane after a loss of continuity in its endothelial lining; it would permit of the penetration of substances through it and into the lens in the sense of Hulke or Nuel. This penetration, in turn, might be followed by the formation of an anterior polar and pyramidal cataract.

In going further, if I am incorrect in considering the conditions described as congenital, and even where such a congenital malformation does not exist, any cause which leads to a dissolution of contact between the lens capsule and its epithelial lining, as, perhaps, a very forcible perforation of the cornea, may alter the conditions in the lens in such a manner that an anterior polar cataract may result.

LITERATURE.

H. Müller, *Graef's Archiv.*, III, 1.
Hulke, "Ophthalmic Hospital Reports," I.
J. Hutchinson, "Ophthalmic Hospital Reports," I.
O. Becker, Zur Anatomie der gesunden und kranken Linse.
C. Wedl and E. Bock, Pathologische Anatomie des Auges.
W. Schoen, Die Staarkrankheit, ihre Ursache und Verhuetung.
E. T. Collins, Researches into Anatomy and Pathology of the Eye.
J. P. Nuel, Etiologie et Pathogenie des Cataractes Polaires Anterieures, *Archives d'Ophtalmologie*, Jan., 1899.

5. ANTERIOR POLAR (PYRAMIDAL) CATARACT.
No capsular epithelium. Beginning of deposits of amorphous lime.

SYMPATHETIC OPHTHALMIA CAUSED BY GLIOMA RETINÆ.

BY ADOLF ALT, M.D.,
ST. LOUIS, MO.

September 2, 1898, Leland J., 5 years old, was led into my office by his father and a medical student, from whom the following previous history of the case was had:

In the spring of 1896 (two and one-half years previous to this visit) the parents accidentally discovered that the boy's left eye was blind. They had never before noticed any inflammatory symptoms in that eye, and they attributed the blindness to the fact that during the preceding summer the child had had, what they called, a "sunstroke." About a year after the blindness had been discovered, the eye became at times injected and painful. Finally, about a year previous to their visit to my office the eye was removed by their family physician, as they stated, to save the fellow eye. The symptom which induced the physician to operate and the parents to consent, was a severe and uninterrupted photophobia of the right eye. In spite of the removal of the left eye, the right eye has since continually grown weaker and has been blind for about two weeks.

It was impossible to get any history of injury to the left eye, nor could the father give any further description of the disease which caused the destruction and removal of this eye. Just before seeing me they had consulted an oculist, who had declared that nothing could be done for the boy, and they brought him to me to see whether I was of the same opinion.

Status præsens.— The left orbit showed nothing abnormal. The right eye was somewhat photophobic, sufficiently so as to force the boy to turn his head down and away from the light. There was a roseate zone of injection around the corneal periphery; in the anterior layers of the cornea a slight band-shaped opacity ran from periphery to periphery in the horizontal

meridian. The anterior chamber was shallow; there was some exudation in the pupillary area and a total posterior synechia of the discolored and atrophic iris. The iris periphery was pressed forward. Atropine, which had been instilled for many months, had had no effect on the condition of the pupil. The ciliary region, especially upward, was painful to slight pressure. No reflex could be obtained from the fundus. Tension was good. Vision was reduced to rather doubtful perception of light.

History and *status præsens* made the diagnosis of sympathetic ophthalmia certain.

Without holding out any definite hopes, I advised continued treatment with mercury and iodide of sodium.

This advice was complied with religiously, the mercury being given internally and by inunctions alternately.

December 6, 1898, the patient was again brought to my office. While the visible conditions of the eye had apparently but little altered, the boy could now count fingers promptly at six feet. The photophobia had disappeared, and the father, who was very happy, told me that the boy was playing about while at home, looking at large pictures, and so on. There was a little better reflex to be seen with the ophthalmoscope, but the crater-shaped pupil was still the same. Yet, besides in his vision, the boy was greatly improved in his general health, and altogether the case now looked very hopeful.

I ordered the same treatment to be continued.

May 23, 1899, the boy was again brought to me. He now walked into my office alone and counted fingers at eight feet promptly. However, the child looked bad and appeared weak. While the right eye appeared little changed, I found in the left orbit a tumor, apparently attached to the periosteum of the lower wall, elastic, round, of a slightly yellowish color, and the size of a nut. A little farther back in the orbit and on the inner wall was a smaller round tumor of the same appearance. The father had detected the presence of the large tumor only a week before.

At the first glance these tumors struck me as being gliomata. The examination of the enucleated eye was now of

prime importance. The father managed to secure it for me, and I promised to advise his physician of what I should find, as he would not consent to have me remove the orbital tumors. This has been done by their family physician, Dr. H. W. Latham, of Latham, Mo., who kindly sent me a part of the large tumor.

As I had suspected, the primary affection was an intraocular glioma exophytum, the walls of the eyeball being still intact at the time of the enucleation. Yet the optic nerve was gliomatous as far back as where it had been cut off. The secondary tumor removed from the orbit was also a glioma.

In his last letter the family physician wrote me that the boy was failing very fast, and comatose most of the time. Thus the end seems near at hand.

Aside from its sentimental and tragic attributes, the case is to me especially interesting, first, on account of the fact, that a glioma produced sympathetic ophthalmia, and, secondly, on account of the marked improvement of vision in the sympathetically affected eye, which later on might, perhaps, by surgical means, have been still further improved.

Sympathetic ophthalmia, due to an intraocular tumor has been observed before, but the cases are not very numerous. The case here related is the first of this kind in my personal experience.

The fact that a sympathetically affected eye may sometimes be improved by continued mercurial treatment is well known also; yet, in my experience, this happy result has only occurred a few times. I think that a syphilitic diathesis which might in some cases be thought of as causing an apparent sympathetic ophthalmia as well as in explanation of the improvement under treatment, could absolutely be excluded in the case under consideration.

REPORT OF A CASE OF SPONTANEOUS RUPTURE OF EYEBALL.

BY B. L. MILLIKIN, M.D.,
CLEVELAND, O.

On the 11th of December, 1896, Mrs. L.C., aged 68 years, was led into my office, blind. The following history was elicited. For a number of years she had complained of neuralgic attacks in the head, but had never experienced much discomfort with the eyes. In January of 1896, she had an acute attack of pain in the left eye, very severe, and within a week a similar attack in the right eye. There was very rapid loss of vision, and since then she has been blind. The patient was a well preserved, apparently healthy woman for her years, and with the exception of her eyes seemed to be in good health. On examination, the eyes showed a wide dilation of the pupils, they not responding to light, very shallow anterior chamber, the lenses completely opaque, the cornæ fairly clear, except a well-marked arcus senilus, conjunctiva congested with veins much enlarged. The tension in both eyes was + 3, being of a stony hardness. The case was evidently one of absolute glaucoma, the result of an attack of fulminating glaucoma, with no possible chance of any relief.

On January 4, 1898, this lady's physician, Dr. Cassidy of Sharon Center, Ohio, called upon me at my office, and gave me these additional facts with reference to her case. About two weeks before this time, the doctor had called in great haste to see Mrs. C., who had just had a severe attack of pain in her eye. The doctor's office was on the opposite side of a small square from the patient's residence so that it was not more than five minutes after the attack when he saw the case. She was sitting at that time holding her head in her hands, the blood streaming down her face and upon her clothing. The doctor distinctly heard the screams of the woman as he passed through the square, indicating the most severe pain. Examination at the time showed

him a rupture of the eyeball nearly in its vertical center, extending from slightly below the lower margin of the pupil upward through the cornea, 1-2 mm. into the sclera. The amount of hemorrhage was considerable, as a towel was half saturated with blood in addition to what ran upon the patient's clothing. After this attack there was no further pain, and the eye gave no great amount of discomfort. The eyeball gradually became smaller and there was no further trouble. On the 8th of March following, I again saw Dr. Cassidy who reported that there was a distinct vertical linear scar, ragged in appearance, in extent as described above. The eyeball was much smaller than the other, it evidently having become phthisical. That the rupture of the eyeball was spontaneous I think there can be no question. The patient was quiet in her own room, with no possible chance of any accident, and there was no history of the slightest injury, not even of her striking the eye with her finger. The other eye was in no way disturbed. I have no doubt that the immediate cause of the rupture was a sudden hemorrhage into the vitreous, probably caused by an acute exacerbation of the glaucomatous condition. It is perfectly reasonable to suppose that the extremely high tension to which the eye had been subjected for so long a time must have materially weakened the resisting power of the walls of the eyeball. The sudden great increase in the tension due to intra-ocular hemorrhage was sufficient to break through the walls at its weakest point. There was no history of any corneal disease.

Thus far in my reading I have not come across any similar case, but undoubtedly such cases have heretofore been reported. I have, therefore, deemed it worth while to put this case on record as illustrating a very unusual condition.

A DESCRIPTION OF THE REFLECTING PHOROMETER AND A DISCUSSION OF THE POSSIBILITIES CONCERNING TORSION OF THE EYES.*

BY FREDERICK HERMAN VERHOEFF, PH B., M.D.,

BALTIMORE, MD.

Through the kindness of Dr. Theobald I have been invited to describe to-day a new phorometer that I devised during the past year. A description of my original model may be found in the Johns Hopkins Hospital Bulletin for May, 1899. Some time ago I placed my model in the hands of E. B. Meyrowitz of New York, who, under my supervision, has made some changes in the mechanical details of the instrument, but the general principles remain the same. I may say that the original model has been in practical use at the Johns Hopkins Hospital Dispensary and also at the Baltimore Eye, Ear, and Throat Charity Hospital, and has proved satisfactory in every way.

The instrument, Fig. 1, differs from other phorometers in that mirrors are used in place of prisms, thus permitting of the greatest simplicity in construction together with the most advantageous movements in the apparent images. The only objection to the mirrors is that each of them produces a double image of the object, due to reflection from the surface of the glass. Where a white spot upon a black background † is used the reflection from the surface of the glass is so faint in comparison with the image from the silvered surface that it is hardly noticeable. As a matter of fact, I have never known it to cause the slightest confusion to the patient, it being unnoticed by the latter. By making the mirrors of speculum metal or by using silvered prisms this double reflection could be entirely overcome, but either method would entail a needless expense.

The arrangement of the mirrors is shown in the diagrams, Figs. 2 and 3. In the new model, however, the mirrors are

* Read by invitation of the society at the 35th annual meeting.

† A black spot upon a white background is still better. It is only when a very bright object, such as a lamp, is used that the double reflections become evident, and even then they cause no confusion.

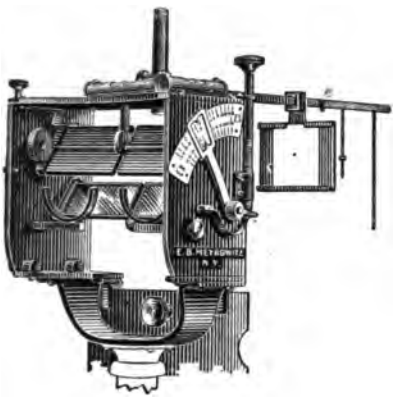


FIG. 1.

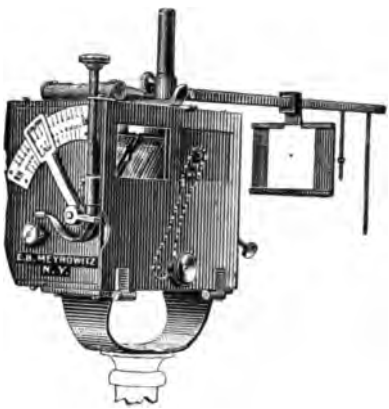


FIG. 1.

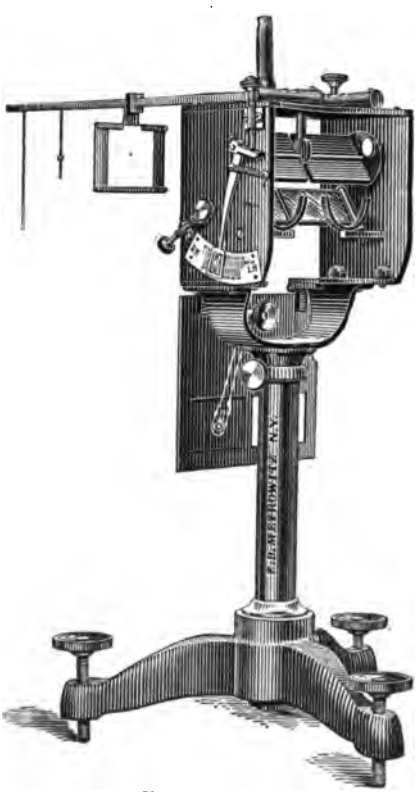


FIG. 1*a*.

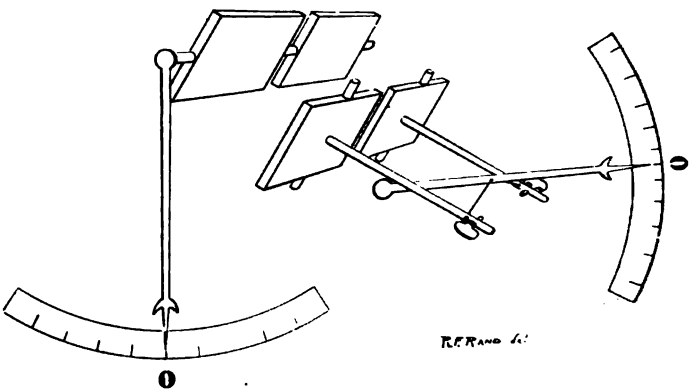


FIG. 2.

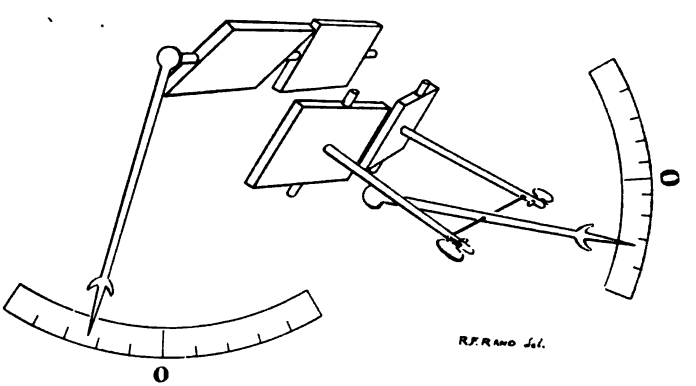


FIG. 3.

moved by eccentrics and not directly by levers. The axes of the two upper mirrors are in the same line and are parallel to the horizon and perpendicular to the direction of sight, while the axes of the lower mirrors are parallel to each other and lie in planes perpendicular to the horizon and parallel to the direction of sight. The inclination of the mirrors is about 36° to the perpendicular. By turning a milled headed screw the lower mirrors may be made to rotate towards or away from each other, lateral separation of the images thus being produced. It is to be noted that this arrangement produces equal, though opposite, movements in the two images. Vertical separation of the images is produced by rotation of one of the upper mirrors, this being accomplished also by means of a milled headed screw.

I shall not discuss here the method of graduating the scales of the instrument. Anyone who is interested will find it sufficiently explained in the article referred to. Two sets of scales are provided, one for distant points — 4.5 to 6 meters — and one for the near point — 30 cm.*

Clips are provided at the back of the instrument so that auxiliary prisms may be used when desired. A double level is attached to the instrument and it is important that the latter should be kept level. It is also important to have the object directly in front of and at about the same height as the instrument.

The diagram, Fig. 4, is intended to illustrate in as simple a manner as possible the construction involved in locating the position of the image for each eye. The relations of object and mirrors to each other are exaggerated in order that the construction lines may be more plainly seen. The mirrors are in their primary positions, so that a line drawn perpendicular to the axes of the upper and lower mirrors will be perpendicular to the plane of the lower mirror. O is the object, M and M^1 the mirrors. From O, a line O A is so drawn that it is perpendicular to and bisected by the prolongation of M. Similarly from A the line A I is drawn perpendicular to and bisected by the prolongation of M^1 at K. All the rays from O striking M will be

* The scales are now graduated by means of one standard prism.

reflected in lines directed from A, and these rays will be reflected from M^1, in lines directed from I. Therefore, an eye directed towards the mirror M^1, will see the image of O at I. The actual path taken by a ray of light from O is indicated by the line O B P E. The locus of A, as M is rotated on its axis R, is evidently the circumference of a circle whose radius is O R. The locus of I during this rotation is the circumference of a circle with the same radius but whose center is at C, R C being drawn perpendicular to, and being bisected by, the prolongation of M^1.

When M^1 is rotated on its axis, which lies in the plane of the construction, it is evident that I will move along the circumference of a circle perpendicular to the prolongation of M^1 and whose center is K. This circle being at an angle to the line of sight, I will apparently take an elliptical path.

From this it will be seen that when the lower mirrors are moved the image pertaining to each moves in the circumference of a circle tilted at an angle of 36 degrees to the perpendicular, and whose center is at the foot of the perpendicular drawn from the object to the axis of the mirror. Since the projection of a circle is an ellipse, the image of each mirror will apparently move in an elliptical course, and will thus not only move laterally, but also upwards to a slight extent. This, of course, would seriously interfere with the accuracy of the instrument if each lower mirror were rotated independently, but, by the arrangement previously described, both mirrors are made to move equally though in opposite directions, and hence the images when viewed with both eyes maintain their horizontality. If the test object is a perpendicular line its image will generate the surface of a cone, and thus when projected the two images, as they are carried apart, will make increasing angles with each other.

A very important feature of this phorometer is a shutter which slides back and forth before the eyes, so that when it is in use the patient can see with but one eye at a time. The shutter is moved back and forth very quickly, a pause being made, however, before each eye, so that time is given for the after image to disappear, and the patient is asked to state whether the object moves or not. If he sees the object apparently moving obliquely, the upper

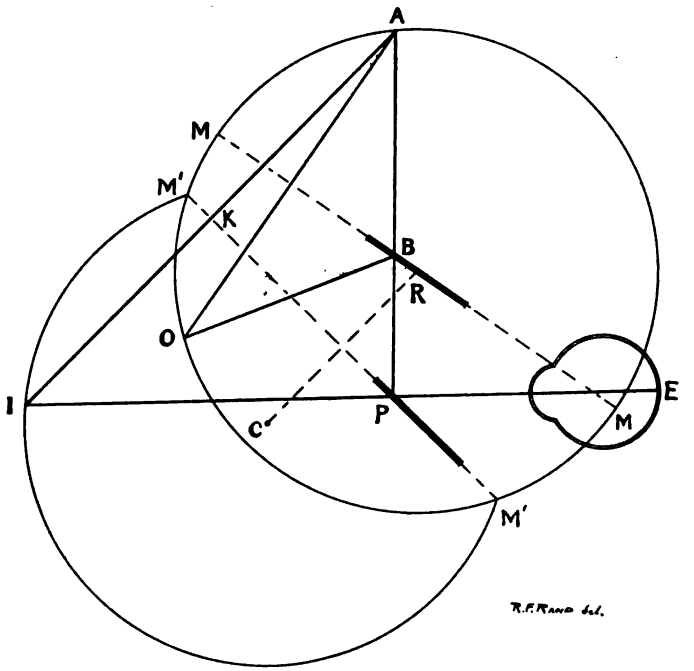


FIG. 4.

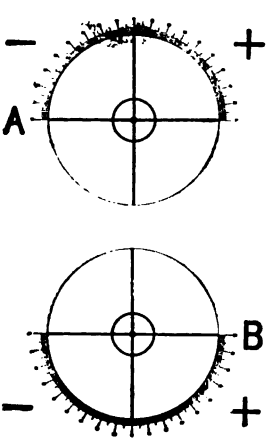


FIG. 5.

mirror is adjusted until the movement is horizontal, and then the lower mirrors are adjusted until practically all movement is overcome. Both the amount of hyperphoria and also the esophoria or exophoria, if present, will be indicated upon the scales.

Since adapting this test to the phorometer, I have found that in principle it is the same as the parallax test of Duane.* It has, however, so far as I know, never hitherto been adapted to a phorometer, and I do not believe that the accuracy of this test has been sufficiently recognized.†

Anyone who has tried the diplopia test upon himself must have been struck by the oscillating movements of the images. This is, no doubt, due to the fact that so long as there are images upon both retinas there will be a stimulus to convergence and perhaps other conflicting stimuli. This is supported by the fact that the eyes under these circumstances always give the sensation of being more or less under a strain. This difficulty does not enter into the shutter test. Again, in order to produce diplopia it is necessary to separate the images so great a distance that it is not only somewhat difficult for the patient to judge accurately of their relative positions, but, with the trial prisms at least, one is never sure but that the lack of horizontality may be due to the method of producing the diplopia, it being necessary not only to keep the patient's head level, a difficult undertaking both literally and figuratively speaking, but to have the bases of the prisms very accurately placed. These difficulties are most marked in testing for hyperphoria, a condition in which accuracy is most demanded. By means of the shutter test, however, both images are finally located exactly upon the two foveas, the ocular muscles at the same time being entirely at ease.

At a matter of fact, I have found that in apparently normal eyes where there is orthophoria at 6 meters (20 ft.)‡ by the diplopia test, in almost all instances the shutter test shows an exophoria of about 2°, and in cases of esophoria the shutter has demonstrated

* *New York Medical Journal*, August 3, 1889.

† In high grades of lateral insufficiency this list may be made by observing the movements of the eyes of the patient as the shutter moves back and forth, and then adjusting the mirrors until the eyes remain stationary. In some cases this is the only test that will avail.

‡ For an interocular distance of 6.6 cm., it requires a convergence of about 1¼° to fix a point 6 meters distant, and hence orthophoria at this distance would mean an actual esophoria of 1¼°.

about 2° less than the diplopia test. As to hyperphoria, in my own case, for instance, I have easily detected ¾° of left hyperphoria which was impossible for me to detect by the diplopia test. Duane, I believe, also found the test especially valuable in cases of hyperphoria.

Stevens' phorometer possesses all the disadvantages incident to the diplopia test, to which test its usefulness is limited, and it is impossible to adapt the shutter test to this instrument. On the other hand, with the reflecting phorometer the diplopia test may be made with equal facility and with the advantage that the amount of separation of the images may be regulated at will. In addition to this, by means of the reflecting phorometer the abduction, adduction, and right or left sursumduction of the eyes may be readily obtained and the instrument may also be used for exercising the eye muscles.

The reflecting phorometer, in connection with a special chart, may be used to estimate the amount of rotation of the eyes about their optic axes. The chart to be used in practice consists simply of two rotary disks placed one above the other upon a flat background, Fig. 5. Degrees are marked out upon the board so that either disk may be rotated any number of degrees desired. Various figures are drawn upon the disks and they, having been placed at a distance of 6 meters in front of the phorometer, are superimposed by means of the hyperphoria screw.

In practice, the best figures for measuring torsion are two right angles such as Stevens sometimes uses in his clinoscope. These are so placed that when combined by a normal eye the appearance of a rectangular cross is produced. In my original article, I stated that torsional combining power could be accurately measured by means of two rectangular crosses. I should have said that this was only theoretically true, for I immediately proceeded to show that as a matter of fact torsional combining power could not be accurately measured in this way.

Theoretically, with a flat board, both disks could not be placed perpendicular to the line of sight. Practically, it is impossible to recognize the excessively slight error this produces. It may be overcome, if desired, by having the board consist of two pieces

hinged together so that they may be set at any angle. I do not find, however, that this is at all superior to the flat board.

The visual plane may be varied either by changing the position of the chart or by altering the inclination of the face. The latter, being the natural method, is the better. The visual plane may also be varied to a certain extent by changing the inclination of both upper mirrors. If it is desired to shut out all other images, tubes may be used. This is in reality unnecessary.

The superposition of the disks could be produced for practical purposes by other means, a Risley prism mounted in a fixed frame, for instance, but the reflecting phorometer offers a most convenient and accurate means of doing this.

In many ways Stevens' clinoscope is a valuable instrument, but it possesses no real advantage over the reflecting phorometer. In fact, it possesses the following disadvantages: (1) Since the tubes are only ½ meter in length, it is necessary for emmetropic eyes to be aided by a + 2D spherical lens in order to preserve the normal relation of convergence and accommodation; (2) an adjustment for the interocular distance is necessary, and as accomplished in the clinoscope this produces a lateral tilting of the disks; (3) it is difficult to hold the disks in union; (4) it is necessary that the patient keep his head perfectly level; (5) it is practically impossible (so far as the surgeon is concerned) to substitute other disks for those attached to the instrument, and the size of disks and the distance at which they are viewed cannot be varied.

DISCUSSION OF THE POSSIBILITIES CONCERNING TORSION OF THE EYES.

As regards torsion of the eyes, there are four conceivable possibilities as follows:

(1) Non-neutralizing declinations* of the two eyes. These include declinations which are numerically equal, but which have the same sign.

* The useful term "declination" was introduced by Stevens to designate that condition in which the apparent vertical meridian of one eye is at an angle to the real vertical meridian, it being understood that all of the retinal meridians have undergone similar displacement. Outward declinations are positive, inward declinations negative in sign.

(2) Neutralizing declinations of the two eyes. These are numerically equal, but have opposite signs.

(3) Torsional combining power or an ability so to rotate as to overcome artificially produced declinations.

(4) Cyclophoria, a tendency for the eyes to undergo torsion, which, however, is overcome by the action of certain of the ocular muscles.

It is obvious that (2) could cause no difficulty in vision. A better definition for (1) would be, a condition in which the apparent vertical meridians are never parallel, and for this condition I have suggested that the term torsional strabismus or squint be used. If it can be shown that (3) has no existence, it follows immediately that cyclophoria, (4),* must be simply an imaginary condition also, (1) then being the only remaining possibility of any moment. I shall now proceed to show that, as a matter of fact, the eyes do not possess a torsional combining power, (3).

In the paper to which reference has already been made, I reported three experiments which abundantly proved the non-existence of a torsional combining power. These experiments were selected from among many others as being very simple, as well as conclusive. I shall briefly repeat these here in a modified form, and, in addition, describe another experiment which shows not only that lines making an angle with each other upon the two retinas are not fused by a process of torsion, but that absolutely no torsion occurs in the eyes even inadvertently during the experiment.

Experiment I. (Fig. 6.) By means of the hyperphoria screw of the reflecting phorometer, the image of disk A, which has been rotated 8°, is superimposed upon the image of disk B. Disk C represents the appearance then presented to the eyes. It is seen that the horizontal line appears double, while the vertical line is single. It is obvious that if the two vertical lines were com-

* F. B. Eaton (*Journal of American Medical Association*, September, 1894), has summed up evidence to show that the ordinary tests for cyclophoria are misleading. He does not offer conclusive proof, however, that cyclophoria is an impossibility. He does not discuss the possibility of torsional squint, nor, in general, of torsional combining power; but he shows the absurdity of supposing that the distortion produced in retinal images by astigmatism could be overcome by torsion of the eyes.

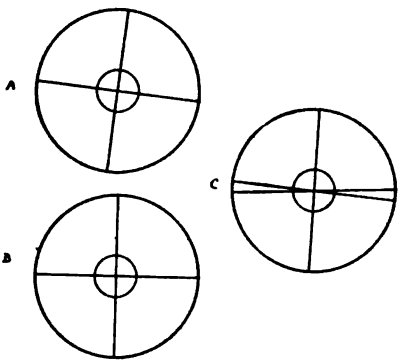


FIG. 6.

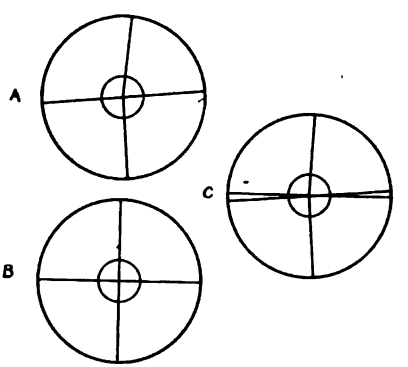


FIG. 7.

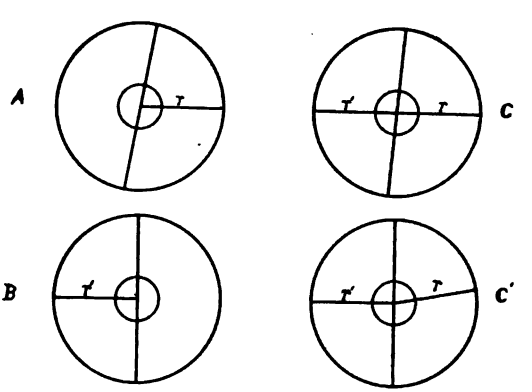


FIG. 8.

bined by torsion of the eyes, the horizontal lines would of necessity also be combined.

Experiment II. Using the same disks as in *Exp. I*, the maximum amount of separation of the vertical lines at which they still remain fused is determined. The same determination is then made, using much larger disks. A much smaller separation is allowed in the latter case. In my case, with disks 3 cm. in diameter, viewed at a distance of 3 meters, the vertical lines remain single when there is a separation of 18°-20°; but when disks 12¼ cm. in diameter are viewed at the same distance, a separation of only 8° is allowed. Torsion could not explain this.

Experiment III. (Fig. 7.) The upper and lower parts of the vertical on A have each been placed at an angle of 5 degrees to the perpendicular, and are thus at an angle of 10 degrees to each other. The horizontal line remains perpendicular to the lower part of the vertical line, and hence has been rotated 5 degrees. C shows the appearance when A and B are superimposed. It will be noticed that the angle between the two parts of the displaced vertical line on A is less than the corresponding angle on C. It is inconceivable how torsion could produce this result.

Experiment IV. (Fig. 8.) When A and B are superimposed it will be noticed that although the displaced vertical line on A is fused with the vertical line on B., the two radii r and r^1 remain horizontal. If torsion occurred these two radii would of necessity appear at an angle to each other as figured in C^1. If disk A be rotated very slightly so that the radius r is no longer horizontal it will be almost immediately noticed in C, thus showing that if torsion should occur the radii would plainly show it.

I have made many other similar experiments, all of which prove the same thing, *i. e.*, the non-existence of a torsional combining power.

Wheatstone,* the inventor of the stereoscope, realized that the images of lines which were placed at an angle to each other upon the two retinas, or, more generally speaking, lines which

* Phil. Trans., 1838; also Phil. Mag., 1852.

occupied non-corresponding points, could still be fused. This fact led him to repudiate the law of corresponding points. The possibility of the phenomenon being due to torsion did not occur to him, and he therefore did not undertake to disprove this hypothesis.

Since Wheatstone's original paper there has been much written upon this subject, and the general opinion seems to be that the law of corresponding points is, within physiological limits, rigorously true. It has been stated that there is no actual fusion of the lines in stereoscopic pictures or in binocular vision in general, and that if the attention be directed towards it the doubling can be detected in every instance.* This view, however, I believe to be erroneous, for my experiments have shown that ordinarily there is in reality no such doubling, but that a single line is produced by the fusion of two others, and that, moreover, this single line is *intermediate*† in position with regard to the other two.

I admit, however, that with practice it is possible to detect the doubling of lines when they are displaced at a distance at which formerly they were completely fused, but when this is done the stereoscopic effect is either lost or much impaired. This upholds the law of corresponding points, but in no way disproves the view of Wheatstone that stereoscopic relief is due to *fusion* of lines that are situated upon non-corresponding points.

Since this fusion is not produced by torsion of the eyes, it must be a psychical phenomenon, and I have spoken of it as being due to a psychical compensation. As shown in experiment (1), this psychical compensation is more marked for lines which have been displaced from the vertical than those displaced from the horizontal. This is not strange when we consider that in viewing perspectives with both eyes, the head being erect, there is no doubling of horizontal lines to be overcome.

It is an interesting fact that the psychical compensation is increased by muscle strain. Stevens makes a similar statement

* Brewster, Phil. Mag., 1844, p. 363. Le Conte, "Sight," 1897, p. 154, 170, 174.

† This proves that the phenomenon is not due to a suppression of the image of one of the lines.

when he says,* "As to the extent to which torsion can be carried, it is greater in convergence than in parallelism of the eyes." Another interesting feature of this psychical compensation is that it renders it possible to fuse a straight line with a curved one. This gives an effect of perspective to the resulting curve. Torsion evidently could not account for this.

A discussion as to the possible nervous mechanism by which the psychical compensation is accomplished, and also further considerations concerning stereoscopic vision, would lead too far.

The existence of a torsional combining power has been assumed by Stevens without sufficient evidence, and from this erroneous assumption, he has drawn far-reaching conclusions. For instance, he says,† "To such a person, with the head in a position nearly upright, the images of horizontal lines seen by the two eyes would be inclined to cross and thus cause confusion. To avoid such confusion the head must be thrown far forward or an irksome voluntary effort directed to the torsional muscles must be brought to bear."

Again he says, "The muscles which principally influence torsion are, notwithstanding their comparative size, less able to exercise constant exertion than those which act in a more direct manner upon the vertical and lateral movements. Hence, a position of the horopter demanding considerable torsion through the influence of the oblique muscles is a position resulting in fatigue and often in pain and exhaustion."

Referring to torsion artificially produced, "That the oblique muscles play the principal role in the act of torsion, under circumstances such as have been mentioned, is unquestioned. They are not, however, the only agents in the rotary movements, for the superior and inferior recti lend important aid in the act."

Further, he says, "With a good power of torsion, the lines may be held in union until each of the pointers mark + 11°. Thus, between the vertical retinal meridians of the two eyes an angle of 22° with its apex down is formed." In the charts that

* Arch. of Oph., vol. xxvi, 1897, p. 199.
† Op. cit., p. 195.

I have recommended, the disks are so large that I, at least, can prove a psychical compensation of only 8°. With smaller disks, however, I have also obtained perfect fusion when the lines were separated 22°. A torsional movement of 22° in one eye, or even of 11° in each eye, could undoubtedly be seen by an on-looker. Stevens, however, says nothing with regard to this point.

If it be the duty of the oblique muscles to keep the apparent vertical meridians of the retina upright, they are certainly very negligent. Otherwise, why do they not overcome the torsion which, as is well known, is produced in the eyes during their various excursions, during convergence with elevation of the visual plane, for instance? The truth of the matter is, that such torsion is practically never so great as to be beyond the limits of psychical compensation.

"The fact of difference in torsion for horizontal and vertical lines has its practical application in many directions." What Stevens had really noticed was the difference in the psychical compensation for the two meridians of which I have already spoken. He apparently did not realize that this could be made evident in one experiment. If the term, psychical compensation be substituted for torsion, Stevens' statement, just quoted, is probably correct.

Stevens claims that exophoria and esophoria are due to the efforts of the oblique muscles in overcoming torsion, and carries this view so far that he says: . . . "I am sure that I shall make no mistake in saying that when the excesses of vertical rotation of the eyes are considered in connection with the normal declinations of the retinal meridians, it will be no longer necessary to perform the well-known and standard operations for converging or diverging squint."* It seems to me that it is much more likely that torsion is the *result* of exophoria or esophoria than that the reverse is the case.

The fact that when in the reflecting phorometer lateral separation of the images is produced, there also occurs lateral inclination of these images, instead of being a disadvantage is quite

* Annals of Oph., April, 1899, p. 162.

the reverse. Just as prisms can be used to reproduce the conditions of squint, so this instrument can be used to reproduce the effect of torsion and in this way the lateral separation of the images being overcome by means of prisms, a little over 8° of apparent torsion can be obtained.

I find that when I carefully avoid artificial hyperphoria I can view without discomfort a scene containing houses, even when there is an artificial torsion of 8°. A torsion greater than this produces a disagreeable doubling of horizontal lines. A doubling which does not occur within the limits of distinct vision is not at all disagreeable. In no case have I noticed any special strain upon my eyes during these experiments, but this may be due to the fact that I have become accustomed to such experiments. If thought desirable, the property of the instrument just mentioned could be much increased by altering the inclination of the mirrors. This, however, would render the instrument unsuitable as an ordinary phorometer.

The phorometer does not, in fact, reproduce the *exact* conditions which would be present in torsional squint, for the eyes must constantly be directed at the fixed point of crossing of the lines in the two images of the view, whereas, in torsional squint the crossing point always corresponds to the point of fixation of the eyes and hence follows, as it were, their movements. If the instrument be moved in unison with the eyes, this difficulty is overcome.

It is not unlikely that in cases of torsional squint a higher grade of psychical compensation may be developed for horizontal lines than is normally the case.

In this connection it might be well to speak of a feature of the shutter test which I neglected to mention in my first article, and that is, its power to make evident the slightest amount of torsion, either real or artificial. When it is desired to determine the amount of torsion in this way the heterophoria of the patient must be accurately corrected by means of prisms and a straight line must be used as an object. If, then, the shutter be moved the line will apparently swing from side to side.

This test has convinced me that my own eyes, as regards torsion, are very slightly out of true. My apparent vertical meridians are tilted in the same direction as were those of Helmholtz, that is, outwards, so that a straight line by the shutter test seems to rotate inwards. In my case, however, the horizontal meridians are tilted to an equal extent. The angle between my apparent vertical meridians is about 1°, while in the case of Helmholtz it was 2½°.

When pure artificial torsion is produced this shutter test gives a decided tilting to a straight line or to any of the objects regarded, thus confirming, what I have already proved, that the eyes do not overcome torsion in objects by undergoing torsion themselves.

If, then, the eyes do not possess a torsional combining power, it follows, as I have already stated, that the term cyclophoria must express a purely imaginary condition, and of this I feel convinced. It also follows that torsional squint is, practically speaking, the only torsional deviation of the eyes to be studied. It is well known that this latter condition occurs where there is a paralysis of certain ocular muscles, but here, of course, one does not get pure torsion. From personal observation, I am unprepared to say whether torsional squint of considerable degree, and unaccompanied by any other form of squint, exists or not, but the observations of Stevens go to show that it is not an uncommon condition. That it alone often causes asthenopic symptoms, I very much doubt, however, for, as I have already stated, I have been able to view a scene without discomfort in which there was a total artificial torsion of 8°. This is not surprising when we consider that in viewing binocular perspectives, there is often an unavoidable lateral angular displacement of retinal images of even more than 8°, to which everyone must become accustomed. Stevens* recognized this latter fact and went so far as to assume that in stereoscopic vision this separation is overcome by torsion of the eyes, a view entirely unsupported by facts and which my experiments completely disprove.

* Arch. of Oph., 1897, p. 202.

It seems to me that instead of the oblique muscles suffering from strain in so far as they are connected with torsion, the recti, if any, would be the ones to suffer. This is so because it would be necessary for the recti to run the point of sight back and forth more than in the case of normal eyes.

It is evident that since psychical compensation is least marked with regard to horizontal lines, strictly speaking, investigations should be made with regard to these lines rather than with regard to vertical ones.

G. C. Savage * believes so strongly in cyclophoria that he has prescribed a —.50D cylinder for the sole purpose of correcting it. Even if cyclophoria existed, such a cylinder would simply make matters worse, for while it might true, for instance, vertical lines, it would throw horizontal lines more out of true than ever. Anyone can convince himself of this by viewing a right angle through a concave cylinder with its axis placed half way between the sides of this right angle. Instead of the latter being tilted as a whole, it is converted into an acute angle.†

CONGENITALLY INEFFICIENT EXTERNAL RECTUS WITH BINOCULAR VISION.

BY J. OSCROFT TANSLEY, M.D.,

NEW YORK CITY.

FIRST CASE.

May 23, 1891, H. J. B., age 18 years, came into my office bearing a letter of introduction from Gen. Lew. Wallace. He was accompanied by his mother, who gave the following history:

When he was a child about six months old it was noticed that he had a slight squint in the right eye, also that his head was turned or twisted to the right and slightly upward; when he looked straight ahead the eyes were straight, but if he attempted to turn his eyes to the right it was noticed that the right eye

* Oph. Record, January, 1899, p. 34.

† This point was brought out by F. B. Eaton, Op. cit.

could not be moved beyond the middle line. About this time he became very irritable, almost to insanity, and the doctor thought he might have meningitis or irritation from an elongated prepuce, but this was found not to be the case. This condition of irritability soon passed away, and has never returned since.

Exam. Patient's height, 5 feet 8 inches; weight, 156 pounds; athletically built, and a fine-looking fellow. As he stood before me his head was turned somewhat to the right and slightly upward. Asking him to look at and follow a pencil with his eyes it was seen that the left eye had perfect motility, but that the right eye, although it had perfect movement upward, downward, and nasally, could not be moved quite to the median line, and certainly not beyond it outwardly; and upon his making a supreme effort to rotate it outwardly the eyelids showed the effort by opening widely and fluttering spasmodically.

He had binocular single vision in any part of the left field or when his eyes were turned slightly or considerably to the left, but a pencil held directly in front of him appeared double, and the farther it was moved to the right the greater was the diplopia. The fields in each eye appeared to be perfect, although they were not taken. There was no part of the right field in which there was not diplopia.

R. V. = 20/50; w. — 1/36^{s} = 20/20 —

L. V. = 20/40; w. — 1/40^{s} = 20/20 improved with cylindric.

My diagnosis was congenital absence or atrophy of the right external rectus with little or no possibility of benefit by operation, but in an attempt to bring the eye to the median line and thus avoid the unpleasant turn of the head to the right I offered to make a small tenotomy upon right internal rectus.

On May 24th a slight tenotomy was made, and at the close the eyes had a perfect parallelism in the median line.

March 30th:

Rt. = 20/50; + w — 1/60^{s} — 20/20.

Lt. = 20/30; + w — 1/48^{c} ax 90 = 20/20 plus.

W — 1/60^{s} over both = 20/20 +

Reads binocularly, Jaeger No. 1 at 4 inches with or without glasses. Otherwise his condition is exactly as when first seen; binocular single vision when eyes are turned slightly or considerably to the left, double vision when eyes are directed directly to the front or considerably to the right. Right eye cannot be made to move quite to the median line and spasmodic action of the palpebral and frontal muscles upon supreme effort to rotate right eye temporally.

SECOND CASE.

May 7, 1899, J. Z., broker's clerk, age 27, says that he has had trouble with his eyes and has had to wear glasses since he was nine years of age. Never squinted, but has always turned his head to the left or eyes to the right when working at anything. This he thinks has been more pronounced in the past than at present, but is quite marked now. If he looks directly ahead or tries to turn his eyes to the left he sees double always. Can read without annoyance; in fact, does his daily duties as a broker's clerk apparently as easy as anyone else, but thinks he cannot see off as well as others can. No pain in using eyes, and comes simply because he thinks that his glasses may need changing.

Examination shows that he cannot rotate the left eye quite to the median line. He can rotate it seemingly in a perfect manner inward to the nose, also upward and downward, but has not the slightest power to rotate it beyond the median line temporally. The right eye has perfect motion.

Turning the face directly to a small point of light distant twenty feet and at a level with the eyes, he has double vision and a 20° prism is required to fuse them, and he apparently turns his head to left 20° to obtain single vision.

Turning the head upwards and keeping the eyes upon a light twenty feet away and at the level of the eyes he has double homonymous vision, apparently the same as when the head is level.

Turning the head downwards, with eyes directed to the light, the same condition obtained, but he thinks that single vision can

be retained longer and does not need so great a deviation of the head to the left to retain single vision.

Turning the head until single vision is obtained, and then placing a 5° prism base up or down over right eye, he has homonymous vision and 5° seems sufficient to express the deviation, as this will bring the lights perpendicular, but will not retain them, as they soon move to an homonymous condition, and this obtains with any prism beyond 5°, showing that the visual sense in the left eye is not very pronounced.

When the face is directly fronting the light he has double vision and, as nearly as he can decide, about 2° hypophoria, which increases as the head is turned to the right, but the increase cannot be measured because the left light becomes too indistinct.

It can be noticed that, when the head is turned to the right, the left eye is depressed somewhat below the plane of the right. diplopia being produced, the tendency to hyperphoria becomes manifest.

Turning the eyes to the right the left eye retreats into the socket somewhat, but not by any means markedly.

Turning the eyes to the left, the right eye appears smaller or rather the left eye more bulging, and at the same time the upper lid seems to elevate and flutter in the effort to rotate the left eye outwardly.

R. V. = 20/20 —; w + 1/22^{s} ◯ + 1/60^{c} ax. 90 = 20/20 +.

L. V. = 20/200; w + 1/20^{s} = 20/100 —

Cylindrics do not improve.

Ophthalmoscopic Examination.

Rt. — Healthy, + 1/16 and slight astigmatism.

Lt. — Healthy, + 1/12 cannot make out astigmatism.

The field examination shows the Rt. field remarkably good and extended temporally beyond the markings of the chart as is usual.

Left field is cut off nasally about 15°, and temporally it is limited sharply by the usual chart markings thus showing that the fields are not markedly affected.

The condition seems to be a congenital atrophy or absence of

the external rectus rather than bands of adhesions restraining the eyeball, for were it the latter it seems difficult to imagine that such perfect motion could be had upward, downward, and nasally. I could suggest nothing to improve.

CYST OF THE VITREOUS.

By J. OSCROFT TANSLEY, M.D.,

NEW YORK CITY.

I have the pleasure of bringing before the society this year an interesting case of cyst of the vitreous. It is, as I take it, a simple cyst, as we understand that term in surgery.

A cyst may be defined as a cavity bounded by a distinct envelope composed of fibrous tissue lined with endothelium, and called a cyst wall; or it may be covered by epithelium and certain secreting structures. A cyst may result from the increase of the secretion of an already formed space or cavity by extravasation into it, or the cavity may be a new formation.

The patient, L. B., age 17, is the son of a practising physician of New York city; and he came to me for advice January 4, 1897, saying that his sight in the right eye had been defective for about a year; there was no pain or discomfort of any kind, but he thought he could not see as well as he had previously; there had been no change for the past year, and it had become no worse than when he first discovered that it was affected.

R. V. = 20/100; w. + 1/48 = 20/70.

L. V. = 20/20, +; Hm. = 1/72.

After putting beneath the lid a disk of cocaine and homatropia, and waiting for full dilatation of the pupil:

R. V. = 20/200; w. + 1/48 = 20/100.

L. V. = 20/20 +; Hm. = 1/72.

Ophthalmoscopic Examination shows:

Lt. = Normal and emetropic.

Rt. = Hyperopic 1. — Fundus healthy.

Examining with a plus 1/6, a very pretty picture of a floating body in the vitreous was seen, and I present two color drawings which illustrate the condition very charmingly. One was drawn by my friend, Dr. Friedenberg, and the other by an artist friend, Charles Levi, whom I taught to use the ophthalmoscope in order to see this particular case.

The floating body was spheroidal, of about the diameter of the optic disk, and at that time occupied about the center of the vitreous chamber. Its specific gravity was apparently but a trifle greater than that of the vitreous body, for when the eye was quiet it slowly settled to the lower portion of the cavity and remained there in contact with the retina, but the slightest movement of the eyeball caused it to jump about with such rapidity that I thought there was more than one. When the head was held forward it would approximate the anterior portion of the cavity, and when the head was thrown backwards and held quiet it would settle towards the disk, so that apparently, if there is such a condition as fluid vitreous, this vitreous was evidently in that condition. There certainly were no septa in the vitreous sufficiently strong to support this body. It had no attachment with any other part of the eye and would rotate in varying directions upon its center, balloon-like, although it generally retained one erect position, seemingly because the dependent portion was a trifle the heavier. It was irregularly spherical, with small indentations, somewhat resembling a potato, and this simile was made still more positive by there being spots and lines of pigment upon the capsule. It had a distinct capsule, which could be clearly made out at the edges by reason of its different refraction, and this capsule was transparent excepting at its pigmented parts. The spots of pigment upon the posterior surface could be distinctly seen through the capsule and contents of the body and recognized as being posterior to the anterior surface by their different motion or parallax.

The spheroid was itself transparent or nearly so, and were it not for the delicate boundary line caused by the refraction of the capsule at the edges and the spots and lines of pigment upon its

CYST OF THE VITREOUS.

J. Oscroft Tansley.

BINNER PRESS

surface, the body would be invisible. There was nothing white, opaque, or fibrous about the body. At first I thought it might be a dead cysticercus; then I thought it might be a filaria, because Kuhnt describes "a sharply contoured glancing white bladder about the size of the optic disk" which was removed and recognized as filaria.

I have examined this patient repeatedly since first seeing him, and I can see no change in the appearance or condition. I have held myself in readiness to remove this body should it show any tendency to cause inflammatory or glaucomatous symptoms, but it is apparently benign, although the presence of the pigment upon its capsule would indicate that at some time there had been inflammatory action.

DISCUSSION.

DR. ALT. — This is very interesting, and in thinking of what might possibly give rise to such a cyst in the vitreous body, it occurs to me that, perhaps, a form of tumor that I have now found in eight eyes affecting one ciliary process only, and looking like an adenoma undergoing mucoid degeneration, and which I have described as adenoma of the ciliary process, might give rise to such a cyst. By becoming detached from the ciliary process, I should imagine it would just about present such an appearance as in this case. It so happens that I accidentally have a slide with me that shows this adenoma of the ciliary process as I have described it. This form of tumor was not known until I found it accidentally, although it has since been described by an assistant of Professor Fuchs, in Vienna, in Graefe's Archives.

DR. RANDALL. — I regret that I have not examined the case. We are fairly conversant with cystic growths attached at the site of a coloboma, and I think this is possibly a cyst of that character, formed at the point of the coloboma, loosened from its attachments, and set adrift by a process of closure of the congenital cleft. Its description certainly corresponds most closely to those conditions, although it may be but a vacuoled vitreous exudate.

A CASE OF PRIMARY TUMOR OF THE OPTIC NERVE.

BY F. BULLER, M.D.,

MONTREAL, CAN.

In the course of twenty-three years' practice I have chanced to meet with three primary tumors of the optic nerve, two in children: a boy and a girl about six years of age, and one in a young adult female. The latter has not been reported as yet. These three cases have been furnished by a material of about 45,000 patients.

The present report is that of the boy six years of age, J. McN., who was brought to me in June, 1892. I have not been able to learn the ultimate result in this case, but hope to do so before this report is published. The history shows that the growth was probably of congenital origin: no other member of the family, nor any relative on either side of the family was ever known to be similarly affected. The history is as follows:

The child is apparently in fairly good health and well nourished. When about three months old, the right eye was thought "to be set," as the parents expressed it. There was probably some fault in the position of the eye, as the family physician is reported to have said he could "cut the cord and make it all right." No intervention of this kind, however, was permitted. The enlargement of the eye was noticed soon afterwards, and progressed very gradually until the age of four years, when the eye became rather suddenly much more prominent.

About this time he had a severe attack of general convulsions. During one of these convulsive seizures he was for a time unconscious. Since that illness he has had no actual convulsions, but is subject to attacks of fear or terror, and swallows frequently at such times: he does not fall or lose consciousness. These attacks are supposed to be brought on readily by errors of diet. In other respects his general health is good. The left eye is normal. The right eye presents a high degree of proptosis, being pushed forward approximately half an inch or more, but is little,

if at all, restricted in its movements. The edges of the lid rest almost on the equator, and at no time fully cover the eyeball. This exposure causes a constant redness and irritability of the eye, evidenced by pericorneal congestion and a slight marginal keratitis, but corneal sensation is good. The pupil is dilated 5mm. and inactive to light. Media clear enough to permit a perfectly good view of the fundus. Although the child is restive and difficult to manage, the ophthalmoscope showed the optic nerve entrance apparently much larger than it should be, of a pale, bluish white tint, with oval outline, and frayed-looking margins. The retinal vessels are very small, but cannot be studied in detail.

Palpation reveals within the orbit a large somewhat elastic mass without distinct outlines, situated quite behind the eyeball.

The complete blindness, the expanded appearance of the optic nerve, and the character of the proptosis, all pointed to the presence of a tumor involving, if not originating in, the optic nerve, and the removal of the growth was advised.

The operation was performed under anæsthesia by ether. The internal rectus being freely divided, secured with a suture, and drawn out of the way, the growth was reached and found to fill the apex of the orbit completely. It was detached with scissors as far back as possible, turned forward and separated from the eye. After this had been accomplished, a considerable mass of soft material was still recognizable at the orbital apex, the removal of which involved much disturbance of the surrounding tissues, as well as a rather copious hemorrhage, on account of which all idea of saving the globe had to be abandoned. After removal of the globe and tumor, chloride of zinc paste was applied in the usual way to ensure complete destruction of any remaining tumor substance at apex. The patient made a good recovery, and was able to return home at the end of two weeks. One month after the operation, he was reported to be in excellent health and quite free from nervous attacks, the orbital cavity only discharging very slightly.

The growth when removed was found to be 10 x 7 millimeters in diameter at its attachment to the eyeball. At this point

the nerve appears as a small circle in the center of a yellowish, gelatinous-looking, rather firm mass. The portion at first removed constitutes about 2/3 of the entire mass, that which was taken away after removal of the eye the remaining third, this portion being concave anteriorly and perforated at its center. This disk-like segment when fitted over the other completes the growth.

In separating the parts with the scissors, they must have passed into a sulcus in the soft tissues, and so divided the tumor into the two portions just described.

The chief interest in this case is the pathological report prepared by my friend and colleague, Dr. Byers, and herewith submitted *in extenso.*

I wish particularly to emphasize the apparent, sudden increase in the proptosis at the age of about four years. This seems to coincide with the observations of Dr. Byers in reference to the œdematous condition he describes in the extraocular lymph-spaces, and which he considers a prime factor in the production of the proptosis. This and the whole subject of primary tumors of the optic nerve will be treated in greater detail in a paper of Dr. Byers now in course of compilation.

PATHOLOGICAL REPORT.

By W. GORDON M. BYERS, M.D.

[From the Pathological Laboratory of the Royal Victoria Hospital.]

The eyeball and tumor in two pieces detached from the globe were handed to me in Müller's Fluid.

Macroscopical Examination.

The anterior and larger portion of the tumor was composed first of all of a 15 mm. long piece of enlarged optic nerve having a transverse diameter of 12 and a vertical diameter 10 mm. The whole was encapsuled by two distinct fibrous sheaths. The inner of these was thin (less than 0.5 mm.), smooth, dense, and loosely

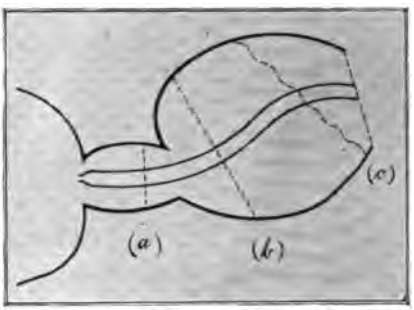


FIG. 1. — Purely diagramatic to show points of section *a*, *b*, and line of cleavage (*c*) between two portions of tumor.

FIG. 2. — (*a*) optic nerve. (*b*) intervaginal overgrowth. (*c*) dural sheath. (*d*) connective tissue sheath external to this.

connected with the outer surface of the spongy layer described below. It was everywhere surrounded by the outer, looser, shaggier sheath to which it was likewise connected by delicate adhesions. This also had a thickness of 0.5 mm.

Viewing the anterior somewhat rounded (from retraction of the outer sheath) cut surface of this piece, the optic nerve proper, 3 mm. in breadth, could be seen occupying a nearly central position, and surrounding this a layer of somewhat spongy tissue which varied in thickness from 3 to 4 mm.

Transverse section at (A, Diagram 1) 8 mm. behind this end (sketch 2) showed in the main the same arrangement as on the anterior cut surface. The chief differences were in the optic nerve proper, which here obtained a breadth of 6mm. in both the vertical and transverse meridians. It was also more eccentrically placed owing to the irregular distribution of the sub-vaginal tissue. This had on the nasal side a thickness of about 4 mm., whereas on the temporal side it measured only about 1 mm. in breadth.

Fifteen millimeters from the globe the tumor made a sharp bend upon itself and became greatly increased in size. It here had a diameter of from 22 to 24 mm.

On transverse section (B, Diagram 1) of this portion (v, sketch 3), the increase in size was seen to be due mainly to a further increase in the sub-vaginal tissue, which had a breadth on all sides of from 6 to 7 mm.; and to a marked thickening of the outer fibrous sheaths, C and D, which were still everywhere intact, but more firmly adherent to one another and to the substance of the enlargement. The optic nerve proper at this point measured the same as further forward, in other words, 6-7 mm.

On the upper and posterior surface of this portion was a large, irregular gap in its continuity. Into this fitted the remaining tumor bit which had been evidently torn away during the operation. The end of this portion which formed the posterior cut surface of the tumor was dense and firm, apparently from great thickening of the outer sheaths, and formed a firm, rubbery collar around the optic nerve, which here measured 5 mm. in the vertical by 6 mm. in the transverse diameter.

As nearly as could be made out, the course of the optic nerve throughout the enlargement (and hence more or less of this as a whole) was at first backwards and nasalwards, then upwards and slightly towards the temporal side, and finally backwards to the optic foramen. On transverse and longitudinal section it was seen that the optic nerve maintained throughout its whole course practically the same dimensions which it attained after leaving the globe, in other words, 6-7 mm. Only in its last backward course was it less clearly demarkated from the surrounding tissue, but even here its size could be made out with considerable exactitude. The pial sheath seemed to merge at every point in the subvaginal overgrowth.

TEASED SPECIMENS.

Teased Preparations. The teased specimens showed cells of the type of embryonic connective tissue. Some of these were bipolar (a, b), and the terminal filaments, often long and wavy, were given off from an oval or spindle-shaped body. In others, the processes were numerous, and the cell-body more or less irregular in shape (c, d, e). Between these two types were numbers of intermediate forms (*e. g.*: f, g). These cells contained a rounded or oval nucleus, which was centrally or eccentrically placed, and stained deeply with hæmatoxylin. Under the microscope were seen, also, a large number of mononuclear cells, unprovided with a termination of any kind (H), but these were not confused with the numerous oval or spindle-shaped bodies (I), which seemed free only because of the detachment of their delicate processes.

OPTIC NERVE.

The nerve bundles varied little if any in regard to size and shape from those of a normal section. The enlargement of the nerve proper noted macroscopically seemed at first sight to be due to a marked increase in the perineurium, but further examination showed that the chief cause of the increase was not so much a hyperplasia of the connective tissue as a pressing apart from one another of the individual septal fibers. The areas between the nerve bundles were filled by a loose branching mesh-

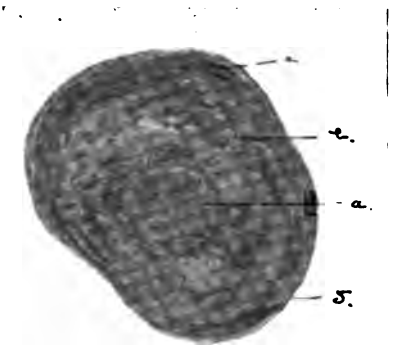


FIG. 3. — (*a*) optic nerve. (*b*) intervaginal overgrowth. (*c*) dural sheath. (*d*) connective tissue sheath external to this.

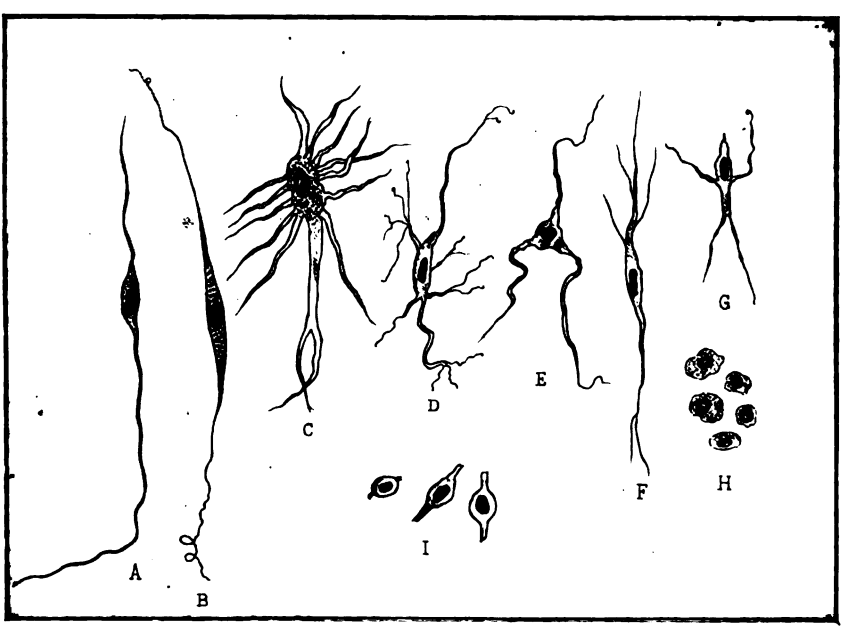


FIG. 4. — Showing types of cells found in teased preparation.

work of connective tissue in which were seen a large number of rounded or oval nuclei staining deeply with hæmatoxylin. Another striking feature in the nerve proper was the presence of large, clear spaces, which existed everywhere throughout its whole extent, between the outer surface of the nerve bundles and the inner surface of the peri- and epi-neurium. These were of irregular shape, and surrounded the bundles in their circumference to a variable extent.

Both the foregoing findings, though made out in celloidin specimens, were especially well seen in thin paraffin sections. Dr. Shirres, neuro-pathologist to the hospital, kindly stained specimens for nervous elements, but we were unable to find traces of axis cylinders in any part of the nerve. The parenchyma in some places, apparently normal, in others and very commonly, was represented only by the endoneurium which formed a honeycombed meshwork, the spaces of which seemed entirely free from tissue substance of any kind. This condition was perhaps more marked in the periphery of the bundles, and was only well made out in thin sections.

Evenly distributed throughout the whole nerve substance were rounded or oval nuclei, which were generally situated over or in the endoneurial fibres, but sometimes appeared attached to the side or lay free in its center.

MICROSCOPICAL EXAMINATION.

In the periphery of the sections were seen densely packed, often wavy, bands of connective tissue corresponding to the outer fibrous sheaths noted macroscopically. These ran for the most part in a concentric manner around the whole of the section, the innermost layers being involved in the changes described below.

The area between the optic nerve proper and the outer sheaths was occupied by a flowing, irregular, branching, network of connective tissue strands, which stained deeply with eosin. The spaces of the meshwork were occupied by large numbers of cells with rounded, oval, or elongated, deeply staining nuclei, and fine processes, which branched or interlaced in an irregular way.

Sometimes the cells had a stellate appearance and the picture was then characteristically myxomatous. At other times the spaces were filled with large numbers of more or less rounded closely packed cells which had an almost epithelial appearance. These masses occurred especially in the region corresponding to the inter-vaginal space, and here the cells often showed signs of degeneration, becoming granular, ill defined, and difficult to stain. In places they formed merely areas of amorphous debris, and here and there clear spaces were seen which had evidently arisen from their complete disintegration — cystic formation.

The individual fibers of the connective tissue strands were often pressed apart from one another much in the same manner as was described in connection with the perineurium. The cleavage spaces thus formed were occupied by the myxomatous cells, and by delicate processes, which extended respectively between the different septa and the individual fibers which composed them.

The pia mater and especially the arachnoid sheath were the structures mostly involved in the changes described above, but the dural sheath in its inner layers was also affected, and this structure was not therefore cut off from the general process.

EXAMINATION OF GLOBE.

The measurements of the eyeball were as follows: Antero-posterior, 20 mm., transverse, 22 mm., vertical, 21 mm. The nasal side of the globe was smooth and shiny, but the whole of the temporal half was covered by a loose layer of tissue which blended forward with the conjunctiva. Behind, at from 5 to 8 mm. from the optic nerve entrance, it became adherent to the sclerotic which was thickened in the same way all over the posterior pole of the eyeball. The external surface of the covering was shaggy, but the internal smooth and shining, and but loosely connected with the surface of the sclerotic. The sac thus formed could be dilated with water, and when filled the appearance was as if a large bleb covered two-thirds of the temporal side of the globe.

The superior, inferior, and exterior recti muscles pierced this covering forwards and received reflections from its substance.

Near the posterior pole of the globe was a distinct pit 5 x 5 x 2.3 mm. in depth. In the bottom of this about its center was the optic nerve of normal size, and above this a conical-shaped piece of tissue in the inter-vaginal space.

The marked pitting was chiefly due to the extensive thickening of the posterior pole of the globe in the way described above.

MICROSCOPICAL EXAMINATION.

At many points, the surface of the sclerotic was covered by a loose mass of curling, intermixed, elastic, and connective tissue fibers filled in with granular debris, a few leucocytes, etc. At a few points, towards the surface, the sclerotic showed signs of œdema, and its vessels were distended.

There is marked enlargement of the optic papilla. The retina, ciliary body, and iris were also marked by moderate œdema, and in the two latter was an excessive proliferation of pigment cells. The retinal pigment layer of the iris was greatly thickened. The sub-conjunctival tissue showed very marked signs of œdema and an infiltration of small round cells in places.

SYNOPSIS OF REPORT.

The following then are, in brief, the pathological findings:—

Moderate increase in the size of the anterior 15 mm. of the optic nerve, and great enlargement along the rest of the structure.

The specimen everywhere contained by the dural sheath and a second connective tissue layer, in all probability the orbital septa bounding the supra-vaginal space.

The optic nerve, uniformly enlarged, was followed throughout the whole length of the tumor, which was principally due to an overgrowth of tissue in the sub-vaginal space.

The enlargement of the optic nerve was due to a marked separation of the fibers of the connective tissue between the nerve bundles; and this was associated with clear, irregular spaces present everywhere between the outer surface of the nerve bundles and the inner surface of the peri- and epi-neurium. The axis cylinders completely atrophied.

The temporal half of the globe was covered by a portion of Tenon's capsule; over the whole of its surface were signs of an œdema, which was present also in the retina, ciliary body, iris, and sub-conjunctival tissue.

REMARKS.

This tumor agrees in its microscopical details with what former writers have described as fibro-myxomatous or myxo-sarcomatous growths. It might, perhaps, be placed with reason in either of these categories. But the changes in the optic nerve, at least, are to be looked upon as due to a chronic distension of the lymph spaces of that structure; and it is just possible that we have here in general to deal with some localized disturbance of the lymphatic system.

A point which seems to have been generally overlooked in connection with these growths, is the part played by the extra-ocular lymph spaces in the production of the principal symptom of the disease, namely, the exophthalmos.

As a result of the tumor growth, occlusion of the supra-vaginal space is brought about, and, as a result, a passive distension of it (varying with the extent to which it is filled by the tumor) and of Tenon's space occurs. In this way the development of the proptosis is augmented.

In conclusion, it is a pleasure to acknowledge the advice and kindness which I have received from Dr. Adami in the preparation of this report; and to thank my brother, Mr. Roddick Byers, student of medicine, for the execution of the drawings.

DISCUSSION.

DR. REEVE. — I would like to ask Dr. Buller whether the sight was lost in the other two cases he referred to. Last summer I saw an interesting preparation in the Birmingham Ophthalmic Hospital with preservation of excellent, if not normal, vision.

DR. BULLER. — There was no sight in this eye, and in the other two cases the ophthalmic picture was entirely different. In neither was there any sight. I consider the early loss of vision with monocular optic neuritis one of the diagnostic features of tumor of the optic nerve.

DR. REEVE. — That is the point of interest, because it was not the case in the interesting specimen I saw.

A CASE OF PRIMARY NON-PIGMENTED SARCOMA OF THE LEFT UPPER LID.

BY C. A. VEASEY, M.D.,
PHILADELPHIA, PA.

The notes of the following case of primary sarcoma of the eyelid are presented both because of the infrequency of the affection and because of many points of similarity to a chalazion.

A. S., a Polish tailor, aged forty-five years, presented himself at the eye dispensary of the Philadelphia Polyclinic Hospital in September, 1898, for the examination of a small growth on his left upper eyelid. The growth had been observed first about four months before he presented himself for examination, and had been gradually increasing in size. At no time had there been any pain, nor was there any history of injury. No family history of tumors of any kind could be elicited.

At the time of the examination there was a small firm ovoidal growth extending upward and outward from near the middle of the lid margin about 12 mm. long and 9 mm. wide, closely resembling a chalazion except in color. It was adherent to the overlying skin, but was freely mobile over the underlying tarsus, and its color was comparable to that of well-diluted claret. It could be picked up with the fingers and lifted as far from the tarsus as the skin of the lid would permit, showing that there was no connection between the two.

The size, position, and gradual growth made it to a certain extent resemble a chalazion, but the peculiar reddish color, so different from any other portion of the lid, caused me to suspect that the growth was perhaps of a different character.

An incision made in the long diameter of the tumor enabled the adherent skin to be separated carefully from it, after which it was dissected out without difficulty. The point of origin was apparently in the subcutaneous muscular tissue overlying the tarsus.

Macroscopically, it was an exceedingly hard encapsulated solid growth of a light reddish color, measuring 10 mm. in its long

and 7 mm. in its short diameter, and on section consisting of several lobules. The surface of the section is smooth and hard. It was prepared in a solution of formalin, and microscopical sections were made by Dr. J. Dutton Steele, who has kindly furnished me with the following description of the microscopical appearances:

"Half of the whole tumor was embedded in celloidin, and the sections stained with Delafield's hematoxylin and eosin. When examined microscopically the growth is seen to have a capsule of fibrous connective tissue that sends processes into the body of the tumor, but cannot be said to give it an alveolar structure, although these connective tissue bands divide it into the lobules mentioned. The whole mass is seen to consist of spindle-shaped cells with oval and intensely staining nuclei that run in bundles in different directions, and are cut at different angles by the plane of the section. The cross-sections of these cells and their nuclei are round. There is a very small amount of intercellular substance. The only blood vessels seen are large channels with walls formed by the cells of the growth with a lining of a single layer of endothelial cells. In several places the blood has escaped and infiltrated the surrounding tissue, forming small hemorrhages. There are no areas of degeneration, and the cells everywhere stain evenly and well. The pathological diagnosis is spindle-celled sarcoma."

At the meeting in 1894 Dr. Wilmer recorded a case of primary sarcoma of the eyelid, and briefly analyzed thirty-five cases that he had collected from the literature. I have found the records of thirteen additional cases, most of them reported since the appearance of Dr. Wilmer's paper, making altogether about fifty recorded cases. These additional cases make but little change in the former analysis just referred to.

The youngest patient was 7 months, and the oldest 76 years of age. The duration of the growth before operation varied from a few weeks to thirteen years. The size of the growth varied from that of a pin's head to that of an apple. In a few all four lids were involved, and in some it was necessary to remove the eye with the growth. In my own list of cases the situation of the

MICRO-PHOTOGRAPH.
Sarcoma of the Eye-lid.

tumor seemed nearly equally divided between the right and left sides, and again between the upper and lower lids, the preponderance of either, if existing, being very slight. It was found somewhat more frequently in females than in males, and this corresponds to the conclusions reached in my analysis of forty-six cases of primary sarcoma of the iris. In about 12.5 per cent., mostly children, the disease was the cause of death. In about 30 per cent. of the cases recurrence was mentioned. It is impossible, however, to form any accurate data as to the frequency of recurring and non-recurring cases, as in many no mention is made of the matter.

Microscopically, 38.5 per cent. were spindle celled, 38.5 per cent. round celled, and 23 per cent. mixed celled. There was more or less pigment in 26 per cent., and 14 per cent. were encapsulated, though in many the encapsulation was only partial.

LITERATURE.

For first thirty-five cases see Wilmer's list, TRANS. AMER. OPHTHAL. SOC., 1894.

Becker. Beitrag. zur Kentniss der Augenlidtumoren. Arch. f. Ophthal., 1895, XLI, 3 abth., 169-185.

Fage. Two cases. Le sarcome des paupières. Arch. d'ophthal., 1898, XVIII, 289-304.

Guibert. Sarcome mélanique de la paupière. Recueil d'ophthal., 1896, XVIII, 527-533.

Heilfreich. Ueber einem Fall von Melano-sarcom des Augenlides. Sitzungsb. d. phys. med. Gesellsch. zu Wurzb., 1891, 100-102.

Horner. Tumoren in der Ungebung des Auges. Klin. Monatsbl. f. Augenheilk., 1871, S. IV.

Jackson. Personal communication quoted by Zimmerman. See below.

Rausohoff. Ein Fall von Sarkom der Augenlider mit multiplen Haut — und Schleimhautsarkom. Klin. Monatsbl. f. Augenheilk., 1898, XXXVI, 257-261.

Rumschewitsch. A contribution to the study of tumors of the eyelids. AMER. JOUR. OPHTHAL., 1891, VIII, 8-24.

Steiner. Ein Fall von Sarcom des Oberlides. Centralbl. f. pk. Augenheilk., Feb., 1899, p. 43.

Thilliez. Melano-sarcome de la paupière superieure. J. d. sc. med. de Lille, 1898, I, 198-201.

Wood (C. A.). Primary sarcoma of the eyelid. Ophthal. Record, 1898, VII, 128.
Zimmerman (M. W.). Primary melanotic sarcoma of the eyelid, with report of a case. Ophthal. Review, XIII, 1894.

A CASE OF EXPULSIVE INTRA-OCULAR HEMORRHAGE AFTER PRELIMINARY IRIDECTOMY FOR CATARACT.

By ROBERT L. RANDOLPH, M.D.,
BALTIMORE, MD.

It seems hardly necessary to preface the report of this case with references to the literature of the subject. We all know that a number of cases of expulsive intra-ocular hemorrhage are on record, but the case which came under my observation is of more than usual interest, and for this reason seems worthy of being brought to your notice.

Mrs. J. C. W., 76 years old. She came to me nearly two years ago for cataract extraction. The cataract was ripe in the right eye, and the left lens was the seat of a number of striations which greatly interfered with her vision. She seemed in excellent health and there was apparently no reason why the operation should not be performed. She could not be induced to enter the hospital, but insisted upon remaining at home, and having her sister and daughter nurse her. Under these circumstances I concluded that I would do well to perform a preliminary iridectomy and to remove the lens a few weeks later. From the uniformly favorable statistics of others and from my own experience, this measure has commended itself to me as being especially adapted to cases where the subjects are very nervous (as was Mrs. W.), and where hospital conditions are absent.

The operation was perfectly smooth. A few drops of blood were left in the anterior chamber. The eye was closed. She passed a comfortable night, and the next day the eye was opened to see if everything was all right. The coloboma was found to

be clean, the blood in the anterior chamber absorbed and the eyeball with scarcely a trace of redness. On the morning of the third day I was called to her, and I found that she had been suffering slight pain all night, and that the eye was running water. On opening the eye it was found very slightly reddened near the incision, but away from the latter location there was a noticeable absence of congestion. The striking feature, however, was the almost complete obliteration of the anterior chamber. The lens had pressed so far forward that the iris was lying nearly against the posterior surface of the cornea. A cold compress was applied and kept on for twenty-four hours, but in this length of time the condition had grown worse, for the lens was being slowly pushed through the iris coloboma, and its upper edge was close to the corneal wound above. The next day the wound looked as though it might open at any moment, so I concluded to remove the lens. No sooner was the corneal section completed than the lens popped out with force, and it was immediately followed by a mass of vitreous which was stained a deep red. The corneal flap was pushed strongly forward, and it looked as though the eye were going to empty itself. On pushing the flap back with the finger the great pressure from within could be distinctly felt.

The finger was then taken away, the lid slipped over and a slight compress applied. All that night she was much nauseated, and the constant retching kept up the bleeding. The oozing did not cease entirely till four days later, when, on opening the lids, the corneal flap was found doubled over and lying on the lower half of the cornea. A bloody mass filled the space between the lips of the wound. Light perception was gone. She had never had any pain since the operation. The flap was again replaced and in a few days the wound was found closed, and three months later the eye had shrunken to half its original size.

Six months after this glaucoma appeared in the left eye, and in spite of all non-operative treatment she was blind in nine months. She was unwilling for an iridectomy, and with the history of the right eye I could not urge such a measure. Six weeks ago, however, I performed paracentesis of the vitreous,

and since this operation she has been entirely free of pain, and this is a longer release than she has had for nearly a year. In this operation two incisions were made in the sclera, one between the external and inferior rectus muscles, and ¼ inch posterior to the lens, and the other between the internal and inferior rectus muscles, and the same distance behind the lens. The last incision was made T-shaped, as being less likely to close completely. While the eye is still hard, the pain has entirely disappeared.

The development of the glaucomatous condition in the left eye justifies us in concluding that the same condition was present in a less advanced stage in the right eye at the time of the iridectomy. It is likely, too, that we had before us the hemorrhagic variety of the disease from the expulsive hemorrhage which followed the operation. This result, I think, contraindicated a similar operation on the fellow eye. This is the second case where I have seen a disappearance of all pain after paracentesis of the vitreous. The case is of exceptional interest, inasmuch as the hemorrhage followed iridectomy, for, as a rule, such catastrophes are seen only after removal of the lens.

It is interesting to note the fact that intra-ocular bleeding apparently did not commence for hours after the iridectomy. The nature of the trouble was not suspected till the morning of the third day, when the evidences of pressure behind the lens were unmistakable, so that bleeding had been probably going on intermittently for days before the lens was removed. The constant reduction of intra-ocular tension caused by the yielding of the eyeball at the point of the wound would explain the persistent character of the hemorrhage. It is needless to add that we undoubtedly had in this case senile degeneration of the blood vessel walls, so strong a predisposing cause to such results.

DISCUSSION.

DR. FRYER. — It has been my misfortune to meet with three cases, all of which have been reported, of hemorrhage after the extraction of cataract. I am very glad to hear Dr. Randolph's report, which was interesting from two or three points, one of

which is that even with the slight change of pressure following the iridectomy, we find in these cases predisposed to hemorrhage, hemorrhage may follow. Another point that I wish to mention is this, that in the suggestions which have been made for these cases upon which we are about to operate for the extraction of cataract, that strychnia should be administered, I disagree. I believe that it should be withheld, because it tends to increase the arterial pressure, and we are much more likely to have hemorrhage, not only in the retina, but in the brain also. I know of nothing that offers any certainty in the prevention of these hemorrhages.

DR. SUTPHEN. — I would mention that two years ago I had one of these cases of hemorrhagic glaucoma and undertook to make an iridectomy, but had a profuse loss of vitreous and final destruction of the eye.

DR. CARMALT. — I would like to ask Dr. Randolph if there was any examination of the kidneys and of the arterial system in these cases?

DR. RANDOLPH. — Yes, there was an examination, and the urinary analysis was negative.

DR. FRYER. — I have also examined for albumen prior to operating upon these cases and have not found it.

DR. MILLIKIN. — I would like to add, in connection with this case, a most interesting one I saw about a year ago after extraction of cataract, in which, on the sixth day after removal of the cataract, on removal of the bandages, the patient was suddenly attacked with a most severe pain. I saw the case within an hour or two, and found that the lips of the wound were pouting extremely, the tension had increased to + 2 or 3, and the ophthalmoscope showed a filling of the vitreous with hemorrhage. It was interesting to note that no serious results followed; the hemorrhage gradually cleared up, and the result has been a moderate success, vision equalling 1/10. Another interesting feature was that this occurred in a gouty or rheumatic subject about 58 years of age.

DR. REEVE. — A year or two ago I reported three cases of destructive hemorrhage after extraction, and there was one case in which I operated upon the second eye successfully; first doing a paracentesis, second an iridectomy, and lastly an extraction, with excellent results. That case suggested the possibility of securing good results in the second eye, owing to the fact that

there may have been local conditions in the first eye that did not apply to the second. We should give the patient the benefit of the doubt.

DR. WADSWORTH. — Two meetings ago I reported some half-dozen cases of hemorrhage after cataract extraction, and also spoke of a case in which I operated upon the second eye, the first having been lost in the hands of a colleague, and everything went perfectly well without any special precautions in the way of paracentesis or anything of the kind. The case reported reminds me of one that illustrates the fact that a considerable hemorrhage need not be fatal. It was a case where, after doing an iridectomy, which was quite smooth, there was so much hemorrhage that the blood filled the anterior chamber and flowed out freely, and, with the fear of general hemorrhage, I stopped the operation. The wound healed perfectly well and everything cleared up. I also remember the patient's great indignation when she found that the cataract had not been removed; it was considered advisable not to tell her at the time on account of the possible effect such knowledge might have on the healing. The cataract was removed later by a colleague with perfectly good results.

RETINITIS ALBUMINURICA AS A FACTOR IN THE CAUSATION OF SECONDARY GLAUCOMA.

BY CHARLES STEDMAN BULL, A.M., M.D.,

NEW YORK CITY.

Several cases of secondary acute glaucoma, which have come under my observation during the past year, have seemed of sufficient importance and rarity to justify their presentation to the society.

The connection between retinal hemorrhage and secondary glaucoma is, clinically speaking, recognized by us all, and hemorrhagic glaucoma has received its name from the presence of these previous retinal hemorrhages. But the connection between retinitis albuminurica and secondary glaucoma does not seem to be so clearly recognized. The connecting link is probably more or less extensive disease of the walls of the blood-vessels, which may be regarded as the common cause of both the retinitis and the

hemorrhages. Yet among the published cases of hemorrhagic glaucoma, it is rare to find that the retinal hemorrhages, which have preceded the glaucomatous attack, are attributed to renal disease. It is generally conceded, and Jocqs has recently confirmed the opinion, that interstitial nephritis is the variety which is usually accompanied by retinal hemorrhages, and in this form of nephritis the general constitutional symptoms vary greatly in different cases. Albuminuria, the most certain sign, is occasionally absent, or is present intermittently. When present, it is but slight in amount and not easily detectible. Two symptoms, or groups of symptoms, are rarely absent, however, and these are cardiac hypertrophy with a doubling of the first sound (*bruit de galop*), and certain cerebral phenomena. So constant are these symptoms that, when found, the urine should be subjected to frequent analysis. The most frequent head symptom is a continous, persisting frontal or occipital headache.

Jocqs (Clinique Ophthalmologique, March 25, 1898) cites two cases of this character, both occurring in women, with exudative retinitis, a very small amount of albuminuria, and epileptiform attacks; in both of which secondary glaucoma occurred. He later reports two more cases of another kind. The first was a man, aged 43, with albuminuria and neuro-retinitis with hemorrhages in one eye, but with no white patches of exudation, in whom the vision was reduced to counting fingers.

Seven months later an attack of acute glaucoma occurred in this eye, for which an iridectomy was at once done, and the pain and increased tension disappeared. The second case was a woman, aged 66, who complained of pain and inflammation in one eye for several days, and when Jocqs saw her, he found a pronounced case of acute glaucoma, with no reflex from the fundus. She had no albuminuria, but there was hypertrophy of the heart, *bruit de galop*, and persistent headache. An iridectomy was done, and the pain and tension subsided. When the vitreous cleared up, there was found retinitis albuminurica with hemorrhages.

In looking over the literature of hemorrhagic glaucoma, I find that many of the published cases were marked by persistent

headache, vertigo, convulsions, and cardiac hypertrophy. We attribute the hemorrhages met with in retinitis albuminurica to arterial degeneration, or cardiac hypertrophy, or both, and in this we are doubtless correct. But we also meet with them in diabetes, in phosphoturia, and in cases of drug-toxæmia, where the connection with disease of the blood-vessels does not seem so clear. In this latter class of cases, some pathologists have thought that the hemorrhages in the retina were due to a general toxæmia by the excrementitious products of the kidneys acting on both blood and blood-vessels.

The cause of the secondary glaucoma occurring in these cases is attributed to a localized ocular arterio-sclerosis. But Jocqs contends justly that this does not explain why the majority of cases of retinal hemorrhage are not followed by glaucoma, nor does it explain why albuminuric retinitis with hemorrhages sometimes leads to secondary glaucoma. He concludes by offering the following therapeutic suggestion: Inasmuch as retinal hemorrhage may be complicated by hemorrhagic glaucoma, and as this complication is a very grave one, and as iridectomy done at the moment of the glaucomatous attack is a dangerous though useful operation, why not make an iridectomy as a systematic, precautionary measure in the grave cases of retinal hemorrhage, which are most likely to be followed by hemorrhagic glaucoma.

Priestley Smith recognizes that in a certain group of cases of secondary glaucoma, the outbreak depends on a diseased condition of the blood or blood-vessels, which leads to thrombosis, retinal hemorrhage, and exudation into the retina; and in these cases the excess of fluid is in the vitreous chamber, and the intra-ocular hemorrhage is sometimes the starting point. He believes that hemorrhagic glaucoma is always secondary, and is of great importance clinically, because of the failure of all operative treatment to give relief.

Panas, in discussing secondary glaucoma, makes the interesting statement that most varieties of retinitis do not cause increase of intra-ocular tension, but that congenital retinitis pigmentosa

in an advanced stage does. This statement I have had no opportunity of verifying.

One curious fact, for which I have seen no explanation offered, is that secondary glaucoma occurs much more commonly among women than among men.

In almost all the cases of secondary glaucoma preceded or accompanied by retinal hemorrhages and exudation, it is quite impossible to decide whether the glaucoma is really secondary to the hemorrhages, or whether the two are simply associated together. In all the cases of secondary glaucoma published, which have been submitted to microscopical examination, the filtration angle has been found closed, and degenerative changes have been found in the intra-ocular vessels, notably those of the retina.

CASE I. Acute glaucoma following exudative retinitis albuminurica.

In December, 1897, a lady, aged 72, was sent to me, complaining of failing vision in both eyes, and with a note from her physician that the patient had contracted kidneys, with albumen and casts in her urine. She had been rheumatic for years, and at times had been completely crippled. About a year previously she had had an attack of inflammation in the right eye, the nature of which was unknown, but as it was painful and obstinate in resisting treatment, and the vision had been for a time impaired, it was presumably an iritis. She made a complete, though somewhat slow, recovery, and on examination I could find no trace of adhesions, though the iris was widely dilated with cocaine. There was no external evidence of disease, and the iris in both eyes reacted to the stimulus of light and convergence. The vision was 20/40 — and could not be improved. The patient was slightly hypermetropic, and there were faint opacities at the periphery of both lenses. There was a well-marked exudative retinitis in both eyes at the macula, but there were no hemorrhages. There was extensive endarteritis and endophlebitis in both eyes, and considerable general œdema of the retina. Her general physical condition was for her age extremely good. A four per cent. solution of cocaine was ordered to be instilled

three times a day, the eyes were protected by smoked glasses. and she was treated by her family physician in connection with myself. In about three weeks the vision began to improve, and the retinal œdema subsided, and she regained her usual health, but the patches of exudation in the retina remained unchanged. In May, 1898, five months later, she had another attack of acute retinitis in the right eye, this time accompanied by hemorrhages, which was treated in the same way, and from which she also recovered. Early in November last I was called to see her, and found the right eye greatly inflamed, with all the signs of acute glaucoma. The attack had begun three days before with pain and rapidly failing vision. The cornea was hazy, the iris swollen and dilated, the fundus invisible, the tension + 2, and the patient was suffering severe pain. There was a small amount of blood in the anterior chamber. In view of the recent hemorrhages in the retina, and the present hemorrhage in the anterior chamber, I feared that it might be hemorrhagic glaucoma, and determined on an iridectomy with considerable hesitancy. The operation, however, was done at once under a ten per cent. solution of cocaine, and the resulting hemorrhage was profuse. The pain, however, ceased at once, the wound healed completely in three days, the blood was all absorbed in a week, and two weeks after the operation the vision was restored to what it had been before the glaucomatous attack. This patient was last seen on March 6, 1899, and vision was then 20/40 in the right eye, and 20/20— in the left eye.

CASE II. Acute glaucoma following exudative retinitis albuminurica.

In May, 1898, I was called to see a lady, aged 45, who had had contracted kidneys, with casts and albumen in the urine for nearly two years, the urine being of very low specific gravity. Her vision had been failing for about a month, and I found in the right eye a well-marked exudative retinitis with numerous hemorrhages. The left eye showed a general œdema of the retina, but no patches of exudation. Her general condition was bad, and I gave an unfavorable prognosis. She was a myope, but the media were clear. The right eye had a visual acuity of 20/70 and the

left eye had 20/50, unimproved. Atropine and dark glasses were prescribed, and she was treated by her physician and myself with but little hope of any favorable result. After some weeks the retinitis subsided and her vision improved, though the patches of exudation remained. In October the vision again grew worse, and the retinitis in the right eye was found to have returned. Early in November the right eye was attacked by acute glaucoma, which was recognized by her family physician, and I was again sent for. I saw her within twenty-four hours of the onset of the attack, and found the glaucoma at its height. The eye was very hard, the ciliary injection marked, the iris swollen, and adherent to the lens-capsule. The cornea was steamy and the vitreous filled with a dense opacity. There was blood in the anterior chamber and the pain was intense. Vision was reduced to perception of light. The patient's general condition was bad, and an iridectomy seemed out of the question. I did a large anterior sclerotomy, which was followed by considerable hemorrhage. The pain ceased within half an hour, and there were no ill effects following the operation. The inflammatory process slowly receded, the blood was absorbed from the anterior chamber and from the vitreous, and the vision slowly improved. A mixture of pilocarpine and cocaine was instilled regularly, and hot applications were applied. The patient's general health again improved, and three months after the operation the vision in the right eye had risen to 20/100, and has remained at this point ever since.

CASE III. Acute glaucoma following retinitis albuminurica.

On November 20, 1898, I was asked to see, in consultation with a member of this society, a lady, aged 45, the family physician being present, and the following history was given me. She belonged to a family, all of the members of which had died, at or near middle life, from contracted kidney. The patient had had albuminuria and casts, both hyaline and granular, for about a year, the urine being of very low specific gravity. In May of last year the vision of the right eye became affected, and the presence of retinitis albuminurica with hemorrhages was recognized. The vision remained about the same until October 14th, when it suddenly grew worse, and was accompanied by some dull

pain. This condition remained unchanged for about a month, but on November 15th, the pain became very severe and the eye injected. She was seen by two ophthalmologists who recognized acute glaucoma, and one advised immediate operation. When I examined the patient, I found the following condition of things present. There was marked ciliary injection, the cornea was " steamy "; the aqueous humor was hazy; the iris was irregularly dilated and adherent at several points to the anterior capsule; there were opacities in the lens, and the vitreous was so infiltrated that only a dull, red reflex was seen from the fundus with the ophthalmoscope. The eye was very hard, T + 3, and there was very severe pain. The left eye was normal. In view of the history of the case, the general condition of the patient, the retinal hemorrhages, and the evident extensive degeneration of the blood-vessels, I advised against operative interference, for fear of hemorrhagic glaucoma. I suggested hot bathing and anodynes to relieve the pain, and pilocarpine and cocaine to be instilled frequently. I have not heard from this patient since, and do not know what the result has been.

CASE IV. Acute glaucoma following retinitis albuminurica.

In October, 1898, a gentleman, aged 57, was sent to me by his family physician because of a supposed necessity for a change in his glasses, and for a dull headache supposed to be due to an uncorrected astigmatism. He was a large, heavy man, who had recently lost very decidedly in weight, and had a pasty complexion. He led a sedentary life and smoked too much.

The refractive test showed: R. E. V. = 15/20 + with + D 2 ⊂ + D 0.75 axis 90° — L. E. 15/40 + with + D 1 ⊂ + D 0.75 axis 90°. With the *right* eye he read Jæger 1 with + D 4.50 ⊂ + D 0.75 axis 90°, but with the *left* eye he could only read Jæger 10 with + D 3 ⊂ + D 0.75 axis 90°. The media were clear, and there was a well-marked exudative neuro-retinitis without hemorrhages in both eyes, most marked in the left eye, where the œdema was extensive. His urine had been examined from time to time in the past, because of his gouty condition, but nothing had been discovered but an excess of uric acid. I corrected his refractive error, told him frankly his condition, and communicated with his

family physician, who at once supervised an active medical and dietetic treatment. Early in December he had a severe attack of uræmic coma, which was preceded by a violent pain in the head, but no convulsions. He was unconscious for nearly twenty hours, and when he regained consciousness his speech was markedly affected and the vision of both eyes much impaired. An ophthalmoscopic examination then made revealed numerous retinal hemorrhages. The urine drawn during the attack showed a specific gravity of 1005, urea 1.75 grains to the fluid ounce, a large amount of albumen, and many hyaline and epithelial casts. The next day, thirty ounces of urine were passed, which showed a specific gravity of 1008, much less albumen, and a diminution in the amount of urea. One month later the specific gravity was 1010, and there was no albumen. From this time he slowly improved in health, there was only a trace of albumen in the urine, but numerous casts were always found. The vision improved, but his speech remained decidedly affected. Early in June, 1899, his vision again became more impaired, but the ophthalmoscope showed no new hemorrhages, though it did reveal an increase in the retinal œdema. On June 13th, an attack of acute glaucoma came on in the left eye with severe pain, beginning early in the evening. I saw him early the next morning and found that vision in the left eye had sunk to perception of light, and the eyeball was very hard. In view of the past history of the case and his generally depraved condition, I did an anterior sclerotomy on the left eye, which was accompanied by a profuse hemorrhage, not only into the anterior chamber, but, as the subsequent examination showed, into the vitreous also. The pain ceased at once, but the blood was not absorbed from the anterior chamber for a week, and it was nearly three weeks before absorption of the blood in the vitreous had advanced enough to permit an ophthalmoscopic examination. At the last examination, made one week ago, the vision in the left eye had risen to 20/200. The right eye has remained free from any glaucomatous symptoms and still has an acuity of vision of 15/40 with correcting glass.

DISCUSSION.

DR. PROUT. — I only want to say that so far as I know we do

not know yet what is the starting point of glaucoma. One of Dr. Bull's cases was in a family where there was a great deal of kidney trouble, and I wish to suggest that possibly we could gain some knowledge of the character of glaucoma if we could follow the cases and see what diseases they have and what these patients die of. This might throw some light on the etiology of glaucoma. Mackenzie says it is often associated with gout and the rheumatic diathesis. I believe uric acid has much to do with its causation. Might not a collective examination and discussion of this subject by this society at its meeting two years hence (1901) result in some increase of our knowledge in regard to it? I am not aware that this has ever before been suggested.

DR. WADSWORTH. — Dr. Prout's remarks incline me to speak of a case, which, however, does not throw much light on the origin of glaucoma. A lady between 50 and 60 years of age came to me some years ago with loss of sight. There were hemorrhages, small and scattered all over the retina of one eye. Careful examination by the family physician failed to reveal any defect whatever. A year or so later she came to me with secondary glaucoma, and the eye was enucleated. I was called again after another year or so because of the same condition of secondary glaucoma in the other eye. She had not long after enucleation of the first eye lost sight in the second with the same symptoms that occurred in the first, and, from what I told her on that occasion, she had concluded there was no use in consulting me concerning the second eye. I performed a sclerotomy, because, although she was blind, she desired to preserve one globe if possible. This relieved the pain for about a week, then it came on again and the eye was enucleated. The lady lived for perhaps ten years afterward, and no disease was ever discovered until she developed pneumonia and died. I relate this simply as negative evidence.

DR. HOWE. — While the causation of glaucoma is still under consideration, I would like to mention one element that has been referred to already, that is, heredity. It is possible that some may remember a communication I made a number of years ago concerning a family named Donnocker. Since that time I have operated upon three, or, I think, four more of the same family. You know, of course, that Von Graëfe called attention to the heredity of this disease, and, in looking over the literature at the time of my first communication, I found quite a number of instances of that sort, but this is the most pronounced case I know of.

DR. MITTENDORF. — Concerning the heredity of this trouble, I think it is a well-known fact that the Hebrew population is extremely prone to this disease. The hemorrhages may exist for some years without the glaucoma coming on, and then it appears suddenly in both eyes. I remember one gentleman who had for several years a hemorrhagic retinitis and then glaucoma. He was operated upon without producing any hemorrhages in the vitreous in either eye, but the nerves went on to atrophy. He had renal trouble; yet it was not a pronounced case of retinitis, morbus Brightii, and there were no marked changes in the region of the macula lutea.

CASES OF METASTATIC PANOPHTHALMITIS.

BY B. L. MILLIKIN, M.D.,
CLEVELAND, OHIO.

On October 5, 1896, I was called in consultation by Dr. J. H. Lowman, Professor of Medicine in the Western Reserve University, to see a case of panophthalmitis, evidently metastatic in its character. This has been the only case with a similar cause that has come under my observation. In a recent conversation with Dr. Lowman he informed me that he had had two other cases of monocular metastatic panophthalmitis, and very kindly volunteered to give me the notes on these cases. I herewith submit his report on all three cases, the last one being the case which I saw with him.

"CASE I. Typhoid fever, with monocular panophthalmitis.

"The patient in this instance was a woman of 35 years, a teacher who was overworked. She had always been well and had a good inheritance. She complained first of earache on the left side, but showed fever and soon was in a well-developed typhoid fever. The Diazo reaction was present, Widal reaction was never tried. During the convalescence the ear pain would recur and subside. There was a recrudescence of the fever twice, so that the illness was much prolonged. In the seventh or eighth week the conjunctiva of the left eye became inflamed and choroi-

ditis was diagnosticated. The eye complication progressed slowly; a small abscess came in the upper lid of the left eye and was opened. The irido-choroiditis extended, perception of light vanished, chemosis was extensive, the patient fell into coma and died two weeks after the eye symptoms appeared. This patient suffered very much from headache and earache. There was no otitis media discoverable, and no reasonable explanation for the ear pain could be found. The course of the typhoid was atypical and the relapses were attended with renewed pain in the head. It seems likely that the panophthalmitis in this case was by extension from some meningeal involvement. There was no autopsy.

"CASE II. Monocular panophthalmitis; systemic diagnosis obscure, probably endocarditis.

"The patient was a robust man, six feet tall, weighing 180 pounds, and 50 years of age. He was gouty, had slight arterial sclerosis, but no heart hypertrophy; there was no evidence of disease in the urine. Aside from an acid dyspepsia, he had always been well. On the occasion of his last illness he first noticed for a very few days a slight malaise. When seen his temperature was 100°, in the evening it was 102°. There was slight headache. The spleen was enlarged so that the edge was palpable to the costal margin on deep inspiration. The next morning the temperature had risen and the diagnosis was typhoid fever. There was a slight systolic whiff heard in the heart. Heretofore the heart had been considered normal. Diazo reaction was negative, Widal test was not tried. The third day the fever was higher and cold baths were used. The patient complained that his head ached after the baths. As baths usually relieve the nervous symptoms of typhoid they were discontinued. On the morning of the fourth day the left eye showed the general pink flush that presages panophthalmitis. The pain in the left frontal region was very great, the spleen was noticeably enlarged, the heart remained unchanged, there was no eruption on the skin, nor did any appear later. By noon of this fourth day the conjunctiva was deeply injected, and by evening chemotic. There was slight delirium by noon and partial coma by evening, which became pro-

found by midnight. Irido-choroiditis was diagnosticated. The patient died on the sixth day, two days after the eye symptom was first noticed. On the fifth day there were obscure sounds in the left lower axillary region, that suggested crepitant rales and increased voice sounds. Pneumonia and pulmonary infarct were both suspected. It is possible that this was a case of fulminating septic endocarditis; if so, then septic emboli probably struck the meninges first, and then involved the eye, though the extreme rapidity of the eye inflammation suggests an optic origin to the eye complication. Towards the end the temperature reached 105.5°. Urine showed no changes. There was no autopsy.

"CASE III. Pneumonia with binocular panophthalmitis.

"On the 30th of September, 1896, the patient was seized with a chill, and in twenty-four hours developed the signs of pneumonia in the lower lobe of the right lung. He was a robust man of 38 years, who had given much attention to athletics, and in his sports used much more than usual efforts. Seven years previous to his last illness he had a severe bronchitis. During the attack the heart was very irregular and rapid. There was no means of knowing how long previously this condition of the heart had existed. From the time when he had the bronchitis on this arythmia continued, sometimes in a very high degree, and occasionally accompanied with dyspnœa. He was dyspnœic on effort, a condition he had never known before. The heart increased very slightly in size and never developed murmurs. Otherwise, physical examination of viscera and vessels was negative. Two years after the bronchitis, and five years before the final illness, he had a cerebral stroke with a right-sided hemiplegia and aphasia. From this he recovered so that in a year he walked and talked very well, and continued to improve. The heart remained apparently the same. The pneumonia, which was his last illness, extended on the third day to the lower lobe of the left lung. There was not much difficulty in breathing, the heart was not embarrassed, and the temperature ranged from 100° to 103°, and the pulse from 100 to 115 per minute. The urine contained neither albumen nor sugar. The spleen was not enlarged. There were no repeated chills. The disease was in no

way, in fact, particularly unusual until the fourth day, when the conjunctiva of the left eye was generally, though not deeply, congested. The congestion increased rapidly, so that the chemosis was present in twenty-four hours, and the vision was distinctly impaired. At this time, the fifth day, the conjunctiva of the right eye was congested, and manifested the same changes that the left eye had shown the day before. Dr. Millikin saw the patient at this time. He found the humors of the left eye dim, but the fundus of the right eye was clear. On the sixth day the blindness was complete in the left eye, the inflammation of the conjunctiva severe, and the right eye following on in the same role. Blindness was complete, perception to light absolutely gone on the seventh day. Death occurred on the eighth day of the disease, four days after the appearance of the first eye symptoms. There were no cerebral symptoms until the sixth day of the pneumonia, two days after the ophthalmic complication, and these consisted of listlessness and somnolence, which gradually deepened into coma. There was very slight delirium, and no pain in the head. There was no crisis in the pneumonia, and the disease ended with a terminal rise of temperature. Clinically, it seemed as if the eye complication was embolic. It does not seem as if the ophthalmitis could have extended from the meninges, for there were absolutely no meningeal symptoms. There were no developments in the heart, no murmurs developed. There was no autopsy."

As indicated in the above history, I saw this last case with Dr. Lowman, on the fifth day of the disease. At the time of my visit, the patient was entirely intelligent, and talked in every way rationally, complaining, however, of very little pain. In fact, one of the striking features of the case was the almost complete absence of pain in his eyes during the illness. An examination at this time showed the classic symptoms of panophthalmitis of the one eye, the puffing of the eyelids, the chemotic conjunctiva, the haziness of the contents of the anterior chamber, showing decidedly the development of a purulent condition of the mediæ of the eye. No vision was present in this eye, but vision seemed to be perfectly good in the other one. There was slight congestion of the conjunctiva of the second eye, and an examination with the ophthal-

moscope, such as could be made under the circumstances of the patient being in bed, a very sick man, showed the mediæ entirely clear with no gross pathological lesions of the eyeground. By the following day, when a second visit was made, the second eye had passed through the same phases of development of the disease as the right, and showed at this time a fully developed attack of panophthalmitis. The general condition of the patient had become much more serious, the stupor had deepened very materially, although the patient could still be roused with considerable exertion. The patient even at this time did not seem to complain of pain in the eyes or head. The eye first affected showed all the symptoms of fully developed panophthalmitis. As indicated in Dr. Lowman's notes, the patient died the second day after my last visit. It is to be regretted that no post-mortem examination could be made in the case, nor was it practical to make bacteriological cultures of the eye contents.

During the time that I have been especially interested in the preparation of these notes, I have made inquiries in person and by letter of a considerable number of the physicians in general practice in the city of Cleveland, and I have thus far found no one who has seen any similar case in his practice. I am led, therefore, to believe that three such cases as are here reported in the practice of one gentleman is an extremely rare experience. Of course, panophthalmitis from local causes is a common disease, but metastatic panophthalmitis is extremely unusual. In looking up the subject I find that the vast majority of cases of this sort have occurred in puerperal conditions. As indicated by Dr. Lowman, I have no doubt the first of these cases was due to an extension from the meninges, the septic material being carried to the eye, producing the low grade of irido-choroiditis, terminating later in the well-marked panophthalmitis. In the second and third cases it is entirely probable that the disease was embolic in character, perhaps the pneumo-coccus being carried in large quantity to the eye, thus very rapidly developing the well-marked symptoms of panophthalmitis from the start. The unfortunate thing in all these cases is the very rapid termination of them in death, with no possible hope of relief from treatment. Un-

questionably a difference must be recognized between the first case and the other two, placing them rather in a different category. The slow development of the purulent irido-choroiditis in the first, having grafted upon it finally the panophthalmitis, would indicate a different method of infection, the later attack being a secondary, general infection, resulting from the first local disease. The second and third cases were undoubtedly pure fulminating examples of profound infection, the septic material involving all the tissues of the eye very rapidly in its attack. In the third case, the attack in the eyes could not have been secondary to an infectious meningitis, for there were no evidences of brain or meningeal disturbance until after the first eye had developed a general, well-marked inflammation, the somnolence then passing rapidly into stupor and coma a short time before the fatal termination. It is unnecessary in this paper to discuss the general question of metastatic panophthalmitis. Those who are interested in the subject are referred to the able discussion of it in Norris & Oliver's "System of Diseases of the Eye."

DISCUSSION.

DR. FRYER. — These metastatic cases are certainly very interesting, and it would seem that there are some peculiar forms of sepsis that would make the condition. I saw during the Civil War a large number of cases of pyemia, but I remember only one case in which there was metastatic trouble within the eyeball, which is somewhat remarkable.

DR. SUTPHEN. — Two years ago I reported to this society a similar case to that of Dr. Millikin, and the man is still living. He had pneumonia with some cerebral symptoms, and the disease followed in the second eye quite rapidly.

DR. RANDALL. — My only experience with it has been in puerperal cases, and the case that impressed me most was one of extra-uterine pregnancy, but the patient made a very good recovery.

DR. RANDOLPH. — About three years ago I reported in the Annals of Ophthalmology an interesting case of a child nine months old in whom it was absolutely impossible to establish a cause for the disease; there was no local reason for it so far as we knew. The panophthalmitis developed rapidly, and finally

the eyeball burst. It was unmistakably a case of metastatic trouble, and the only disease the child could have had was, possibly, la grippe. It would have been interesting in these cases of Dr. Millikin's to know whether the pneumo-coccus was present.

DR. ALT. — I would like to ask Dr. Millikin whether there was an epidemic of cerebro-spinal meningitis at that time, as these cases have some times been referred to that. I have seen such cases during such an epidemic, but never with fatal issue, but, of course, as no bacteriological examination has been made, we cannot say whether or not the meningo-coccus intra-cellularis was present in your cases.

DR. WADSWORTH. — I have certainly seen a number of cases where the purulent inflammation has occurred within the vitreous chamber due to cerebro-spinal meningitis, and, I think, to other causes.

MULTIPLE RUPTURE OF THE PUPILLARY BORDER OF THE IRIS WITH SUBSEQUENT DEVELOPMENT OF MYOPIC ASTIGMATISM.

BY W. F. MITTENDORF, M.D.,

NEW YORK CITY.

Rupture of the pupil is usually followed by mydriasis. These words are taken from a justly proper textbook on ophthalmology, and this is all which is said about it.

The accident must be rather a rare one, for many works on diseases of the eye do not mention such an injury to the iris at all.

The case which I am going to report to-day is of unusual interest, by the facts, that there are six distinct ruptures of the pupillary border, that there is no unusual dilation of the pupil except at the seat of the ruptures, and that a myopic astigmatism of 3 D was observed after the injury had healed with the axis of the cylinder in the direction of the most pronounced rupture, that the eye was apparently good and normal before the injury, and that the ophthalometer of Javal shows a normal cornea, and that therefore the astigmatism must be lenticular.

Mr. H. H., a salesman, 48 years of age, called on me August 17, 1898, with the following history: August 10th, consequently one week previous to this visit, as he was passing through City Hall Park, he was struck, accidentally, by a stone thrown against his right eye, by a boy who had intended the stone for somebody else. The force of the blow was so great, that he fell and lost consciousness, and was taken to the emergency hospital, where he was treated for several days. He states that his eye was so swollen that he could not open it for two or three days, and that he could not see with it at all when he could open it. When he presented himself at my office, the vision had begun to improve, and there were still traces of blood in the anterior chamber and in the vitreous humor. The upper part of the pupil appeared to be attached to the lens, and yielded only after atropine had been used for some time. The lower and outer margin of the pupil had, however, a serrated appearance with the larger fissure in the middle, and about 20° below the horizontal meridian of the eye. The iris was not attached to the lens at this point, and yielded readily to the action of a mydriatic, without, however, losing its irregular outline. The lens and cornea were perfectly clear, and showed no traces of any injury. The vision of the left eye was 20/xx, but that of the injured eye was barely 20/cc. In course of time the blood became absorbed, and the media became clear, and a normal condition of the fundus oculi could be demonstrated. The action of the pupil, if exposed to light, is almost normal, which would prove that the sphincter of the iris is not entirely ruptured.

The vision improved gradually to 20/lxx, but there it remained for some time. At the time of the first visit, a weak, concave glass improved the vision a little, but later there was hardly any improvement obtained by its use. As I have mentioned before, the ophthalmometer showed a normal cornea, and the media had become perfectly clear in the course of a few weeks. The defect of vision was, therefore, due to some other cause, and after trying for some time, it was found that concave cylinder of 3 D gave a vision of 20/xxx ? ? about one month after the injury; but the most remarkable part is, that the axis of the cylinder

corresponds with the direction of the largest rupture, which is downward at the temporal side of the pupil, and the axis of the cylinder has to be at an angle of 15° in order to get the best results in vision.

The pupil yields now readily to the action of a mydriatic, however, the border of it remains irregular, of course, less so than when the pupil is in the normal state. There are six distinct ruptures to be seen, all at the outer border of the pupil, and the largest fissure is about 25° below the horizontal meridian of the pupil, and extends through the entire tissue of the iris.

The condition has remained about the same during the last eight months, and the patient is greatly annoyed by the blurred vision of the injured eye. The lens has remained perfectly clear all this time.

As the lens is always in contact with the iris, and held by it in place, a rupture of the pupil would probably allow a slight increase of the curvature of the anterior surface of the lens to take place at this point, and thus the development of a lenticular myopic astigmatism might be explained; but it is difficult to imagine that an astigmatism of such a degree (3 diopters) could be formed in this way, and, although no dislocation of the lens can be demonstrated, it is just possible that a slight tilting of the lens has taken place, and plays, perhaps, an important factor in the case.

The patient is sure that the eye was a good eye with good vision before the injury, and that he is now greatly annoyed by the blurred vision. However, he refuses to wear correcting glasses, as the other eye is so perfect in every respect.

DISCUSSION.

DR. RANDALL. — Most of us have, doubtless, seen these multiple ruptures of the pupillary margin, sometimes 20 or 30 in one case. In the case which I reported some 15 years ago in this society with choroidal rupture, etc., there was no iris rupture, but there was clearly a tilting of the lens and a myopic astigmatism of something over 5 Ds, which soon entirely disappeared. The astigmatism was clearly due to the rotation of the lens and,

perhaps, to slight rupture of the zonula which naturally increased the convexity of the lens by reason of its relaxation.

DR. HARLAN. — There is good reason to suppose that rupture of the sphincter is more frequent than it is generally considered to be. It may be mistaken for paralytic mydriasis from obtunding of peripheral nerves. Some years ago I reported six cases of multiple rupture, in several of which there was also radial rupture in the continuity of the iris, and also two cases of the other form of mydriasis from injury in which the pupil could be contracted at once by the use of eserine, which, I think, will nearly always be a safe test. In the cases which I reported, and in all others that I could find recorded, the accommodation was either not affected or was slightly diminished, except in one where there was a spasmodic myopia of 2 D, that disappeared immediately under atropia.

A COMMUNICATION UPON ACOIN. A NEW LOCAL ANÆSTHETIC.

BY ROBERT L. RANDOLPH, M.D.,

BALTIMORE, MD.

In the January number of the *Therapeutische Monatshefte* there is an account of the discovery of a new local anæsthetic — acoin — by Trolldenier of Dresden. Trolldenier's first series of experiments to show the toxic properties of this product were made on dogs. His results demonstrated that acoin was much less poisonous than cocaine.

The anæsthetic properties were tested on the rabbit's eye. At first the powder was tried and then concentrated solutions, but in both these forms it proved too irritating, though it produced anæsthesia which lasted "several days." With weak solutions these results were obtained:

1.1000 produced anæsthesia lasting 15 minutes.
1.400 produced anæsthesia lasting 30 minutes.
1.200 produced anæsthesia lasting 60 minutes.
1.100 produced anæsthesia lasting 40-80 minutes.
1.40 produced anæsthesia lasting over a day.

Solutions of 1.40 were irritating though they produced no injury. It was found that the solutions were but slightly influenced by light, and when exposed to the air from 3-11 days were shown to be sterile. So far as I know, acoin has not yet been tested upon the human eye. My first experiments were made with a solution of 1.300.

With this solution I have extracted fifteen foreign bodies from the cornea. It was noticeable, however, that in those cases where the foreign body had been imbedded for some time and where there was congestion repeated instillations were necessary to make the removable possible, and even then the anæsthesia did not seem as complete as with either cocaine or holocain. Where there was no congestion the removal of the foreign body was painless.

One pterygium was removed and I noticed no difference in the anæsthesia from that produced by either cocaine or holocain.

Two tarsal tumors were opened and curetted and the operations were about as painful as when performed under cocaine or under holocain.

I have had no opportunity of making the corneal incision, but I should think that acoin would produce satisfactory anæsthesia for such an operation, so long as the eye was not in a condition of irritation.

The stinging following the instillation of a drop of acoin is greater than that after cocaine. This was shown conclusively. A drop of acoin was dropped into one eye and a drop of cocaine into the other and in every case the acoin was more painful.

It took quite as long to produce satisfactory anæsthesia as it does with cocaine, and longer than it does with holocain. In this respect my results do not agree with those of Trolldenier and Hesse, who call attention to the rapidity of its action. It must be remembered, however, that the experiments of these observers were made on rabbits, and from the behavior of these animals on the operating table we would not be inclined to think that their sensitive nerves were very highly developed; certainly not so much so as in the case of man.

Acoin is a white powder quite soluble in water in the proportion used in my experiments, *i. e.*, 4½ grains to the ounce. It is derived from guanidin, which is found in almost all animal and vegetable cellular tissue. Acoin is related to caffeine and theobromin.

CONCLUSIONS.

1. Acoin in solutions of 1.100 and 1.300 produces satisfactory anæsthesia in an unirritated eye in about the same length of time as cocaine.

2. In more than one case where the eye was congested, repeated instillations of acoin were inadequate to produce satisfactory anæsthesia.

3. Inspection of the cornea with a high power lens failed to show any defects in the epithelium after its use.

4. Acoin has no effect upon accommodation.

5. It has no effect upon the size of the pupil.

6. It does not increase intra-ocular tension.

7. Several experiments demonstrated that the staphylococcus pyogenes albus did not grow in agar which contained acoin in the proportion used in the clinic, and, furthermore, that exposure of this organism to the action of acoin for twenty-four hours was followed by death of the organism. This would look as though acoin were not only an inhibitor of the growth of this organism, but that it also killed this organism after a certain length of time. It is evident that conclusions drawn from this limited experience with acoin may have to undergo more or less modification with further trial.

DISCUSSION.

DR. HOWE. — I would like to ask how the degree of anæsthesia was determined in those cases.

DR. RANDOLPH. — Generally by the sensation of the patient after dropping in a solution. For instance, usually in removing foreign bodies the patients said they felt no pain at all.

DR. HOWE. — I mean in the previous experiments referred to on rabbits.

DR. RANDOLPH. — I have no idea. As a matter of fact, we

know we can touch the cornea of the rabbit often when not anæsthetized without any response or any apparent sensation.

DR. HOWE. — I asked the question because it has occurred to me a number of times in reading of the local anæsthetics that we are drifting into a very inaccurate method of expression. It may be of some interest to call attention to the fact that it is possible to obtain a numerical expression of local anæsthesia. We know that when a sensory nerve is irritated there is a certain amount of increase in the blood pressure. That is a physiological fact. If now one eye of the rabbit be completely under the effect of an anæsthetic and we irritate that eye (that is, the cornea) with a galvanic current of a certain strength for a certain number of seconds, then, we see no rise in the column of mercury connected with the carotic artery. If, on the other hand, the galvanic current be applied for some length of time to the other eye there is a rise of this column, let us say, of 8 millimeters. So, we have for the irritation of the normal eye a rise of 8 millimeters, and for the fully anæsthetized eye no rise at all, and we can easily by this means determine when anæsthesia begins and how long it takes to secure its full effect. A description of this method may be found in Knapp's Archives for 1888. In that article I showed also the length of time necessary for different doses of cocaine to produce the maximum amount of anæsthesia, and I think it would be interesting to ascertain in a similar manner the real behavior of other substances that we call local anæsthetics.

MORE UNIFORM TESTS FOR VISION, COLOR-SENSE, AND HEARING.

BY CHARLES H. WILLIAMS, M.D.,
BOSTON, MASS.

Last winter I was asked by one of our New England railroad companies to re-arrange their tests for vision, color-sense, and hearing. They were then using some American reprints of Snellen's test-types for testing the acuteness of vision; the Thomson's stick of 40 colored worsteds for the color-sense, and the voice for the hearing test.

On looking over their test cards it was found that the size of the letters varied very much on different cards, the height of the letters

on the line that was printed to be read at "20 feet or 6 meters" was, on one card, 43/100 of an English inch, and on another card the same line had letters with a height of only 32/100 of an inch, so that it was possible for a person with unchanged acuteness of vision to be rejected when tested on one card and to be accepted when tested at some other point using a card with the larger letters. The height of the letters which at 20 English feet will subtend a visual angle of 5 minutes is 35/100 of an English inch, and the variation in the size of the letters on the above cards is probably due in part to the fact that the American publishers took for their first copy the earlier test letters of Professor Snellen, which were based on the Paris foot and were intended to be read at 20 Paris feet, or 21.3 English feet; and for their other copy the later editions of Snellen's types, which were based on the French meter and are intended to be read at a distance of 6 meters, or 19.68 English feet. The height of the letters in the first set should be 37/100 of an English inch, and in the later set 34/100 of this inch.

In order to provide some test types which should be accurate for the commonly used distance of 20 English feet a new set was carefully drawn in the office of the division engineer of the company. These were etched and printed so that the height of the letters in the 20-foot line measured 35/100 of an English inch and the width of the component parts of the letters 7/100 of this inch. Thus the height of each letter would subtend the standard visual angle of five minutes and the width of its component parts an angle of one minute, as shown by Professor Snellen to be the angles at which letters should be easily read by normal eyes. In order to put these cards in more portable shape, the letters were printed on cards of $3\frac{1}{2} \times 9$ inches, which can be readily placed in an envelope that will go into the coat pocket. One line of letters was printed on each card, and in order to prevent memorizing and reading the letters from memory three cards were printed with a different arrangement of letters on each card, for each of the required distances of 20, 30, 40, and 50 feet, and as only one card is shown at a time it is very difficult for the person under examination to read the letters correctly unless he can see them. Another feature of these cards is the addition of three cards on

which are printed representations of the ordinary position signals, with semaphore arms. The length and width of the semaphore arms on these cards is the same as the height and width of the letters on the 20-foot card, and when seen at a distance of 20 feet they correspond in size to the apparent size of a standard semaphore arm 46 inches long and 7 inches wide when seen against a good background at a distance of half a mile. The men in service when re-examined are required to read these signal cards at a distance of 20 feet, stating whether the signal stands horizontal at danger or inclined half way or more toward the vertical, at safety, and a separate notation is made of this test on the record blanks. It is found that the signal cards can be read more easily than the letters, for on the former it is only necessary to distinguish the position of the arm, whereas with the letters much smaller differences between C, G, O, or E, F, P, etc., must be recognized. A person with an acuteness of vision of 20/30 as tested by the letters can read easily and correctly the signal card, and even with vision of 20/40 the signals can be read, with some difficulty, but with vision of less than 20/40 they cannot be read correctly.

This has been taken into account in recommending a standard for old employes who have become valuable on account of their familiarity with their work, their good records, etc., and on their re-examination a vision of not less than 20/30 without glasses has been suggested for the men in more important positions concerned with the movement of trains, such as enginemen and firemen, and for other positions in the train and yard service not less than 20/40 without glasses, with both eyes open.

There is need of greater uniformity in the tests used for the color-sense, and it may be stated as a general proposition that no test for color perception is satisfactory unless it includes, first, a test by comparison of colors, in which no colors are named, but which should be made by having such colors selected as look like a standard green, and a standard rose color, the Holmgren worsted test being the best form of this test; and, second, a test with colored lights, in which the intensity of the lights can be varied, and in which the names should be given by the person

examined to the colors as shown. This is simply a restatement of the instructions which were formulated by Donders and Snellen in Holland some years ago, but which have not been so generally adopted as they should be. One difficulty has been that the Donders lantern, which I have formerly used, is not a very satisfactory instrument for routine work. In the lantern I have devised and which is now used on some of the railroads in this country the instrument is put in more practicable form.

The danger of relying on one test, such as Holmgren's or Thomson's, is well shown by three cases that have recently come to my notice on one district of the New York, New Haven & Hartford Railroad. In each of these cases the man examined did not select a single confusion color with the greens or the rose colors, although his selection was somewhat hesitating in two of the cases, but with the lantern test he showed his defect. In one case the man called a red light green in a majority of the trials; in another case the man when approaching a junction point at which three red lights were shown was asked by his conductor what those lights were, to which he replied "green." In one of these cases I am told that the man had brought a certificate from an oculist, who had examined him with colored worsteds, that his color-sense was all right, and it is cases of this sort that make railroad companies distrustful of the value of such certificates.

To emphasize the need of such tests I need mention only one new case of a fireman on one of our large railroads who, after a service of some seven years, was refused promotion on the ground that his color-sense was defective. He left the service of this company, went south, and was given an engine on another road, on the strength of his previous record as fireman; on his second trip he ran past a red signal, caused a collision, and was killed.

In order to insure greater uniformity in the tests by the Holmgren colored worsteds, and to enable a record to be kept at the central office, to which all reports of this kind should be sent for final supervision, approval, and file, I have continued the plan which I introduced some ten years ago on the Burlington system of having each of the 125 skeins in the Holmgren set numbered

with a small metal tag. In order to preserve a continuity of record and as these sets replaced the Thomson's stick formerly in use on the road, the first 40 numbers were given to those colors which corresponded with the 40 numbered colors on the Thomson stick. The other numbers up to 100 had the same plan, the odd numbers being reds or greens, and the even numbers confusion colors; beyond 100 there were not enough of the true colors to continue this arrangement, and from 100 to 125 all the colors were confusion colors, or yellows.

By using these numbered worsteds the men are protected against an arbitrary decision of any examiner; the railroad has a more complete and uniform information in regard to the facts in any case, and the examiners, knowing that their work is subject to supervision, are led to make their examinations with more care and thoroughness.

In arranging my lantern, the object has been to take the colors actually in service, red, green, blue, and yellow, and, by using them either separately or combined with London smoke glass, to alter the intensity of the light, so as to get a series of colors that will bring out the fact of defective perception, especially for red and green, in the small central area of the retina where the images of such small objects as a signal light are formed, and where we are more apt to get defective color perception in cases of acquired defect from excessive use of tobacco, etc. On the front of the lantern are two discs, one with 12 colored glasses, the other with a series of round holes; by revolving the discs any color or opening can be brought before the light. The smallest hole has a diameter of 7/100 of an inch, and at a distance of 20 feet will subtend a visual angle of one minute; the other holes correspond to the width of the different parts of the test letters for 30, 40, and 50 feet. Below each glass in the color disc is a hole with a transparent number lighted by the lantern, and on the diaphragm disc, a series of holes with letters, both screened so that the person under examination cannot see them, but so that the person who is conducting the test can see in the darkened room what color is shown and what size of opening is used, and make a note of it on the record blank, with the name given by the

person examined. It is found that in using this lantern it is best to show the colors first through the largest opening and afterward through the smallest, for if a person is defective in his color perception for red, he will often be able to name the color more correctly when shown through the smallest hole. The reason is that as this hole transmits much less light than the largest, the person who is defective for red will notice when a red color is shown that the light appears very dim, and as he connects this feeble intensity of color with the name of red he can readily give the correct name to this test. On the other hand, with more light from the larger hole, and especially with a red of greater brilliancy, he will be apt to call it green, as has occurred in a case I tested not long ago.

This rule will not hold good for all cases, but in order to get the best results it will be better to test with both the larger and the smaller openings. This lantern puts in more convenient and practical shape the principles which were used in the apparatus I showed to this society at the meeting in Washington in May, 1897.

Colored lights can be recognized at a much greater distance than form signals, and in some tests made by the New York, New Haven & Hartford Railroad Company it was found that the standard red or green lights could be easily distinguished at a distance of a mile on a clear night, provided the lights were not placed too near to each other; but when the red and green were placed 18 inches or 2 feet apart the red light soon killed the green, and at a distance of a quarter of a mile, or less, it was impossible to see any green color in the signal.

In order to have a more uniform test for hearing than the voice, or the watch whose tick varies so much in different watches, a ratchet acoumeter was devised by Sharp & Smith of Chicago for use on the Burlington system. When this acoumeter is held between the thumb and finger with the flat side toward the person examined, by turning the milled head a series of sharp metallic sounds is produced by the ratchet mechanism. It is desirable to have some test of this character in addition to the voice, for on an engine in motion the engineman will often detect some-

thing wrong with the machinery by some sharp sound different from the ordinary noise of the locomotive, and it is well to have a test more resembling this in character.

It is very desirable that more uniformity should be established in regard to the re-examination of the vision of all men concerned with the movement of trains, and that some standard, such as those suggested previously, should be adopted, which may fix the limit of what can be considered as safe vision for such work.

Re-examinations should be made: 1. Three years from the date of the last examination, or yearly when the vision in one eye is less than 20/40. 2. After any accident which might be caused by defective vision, color-sense, or hearing. 3. After recovery from any severe illness or after severe inflammation of the eyes or eyelids. 4. Before promotion.

In regard to the use of spectacles by train, engine, or yard-men in railroad service, there certainly can be no objection to their use for reading train orders or other occasional use for near work, but for distant vision, for the proper reading of a signal which they may be rapidly approaching, and under all the varying conditions of weather, such as fog, rain, snow, etc., it will be found that when the need of assistance from the glass is greatest, as in foggy weather, they will often be a hindrance rather than a help; the moisture condensing on the glass will obscure the vision, and as an engineman cannot be continually wiping his glasses during his run, the tendency will be for him to take them off and depend on his unaided sight. In the physician's office or in the testing room, the conditions being favorable, we can often bring the vision up to the required standard by correcting errors of refraction with glasses, but under the varying conditions of service the glasses may at times be of no use, and the only thing which can be depended upon is the vision without the glass. Therefore, although it may seem to be a hardship in some cases to reject men who can be made to see well in the distance with the aid of glasses, yet it will be safer to require for the re-examination of men in the service a vision of not less than 20/30, with both eyes open, without glasses, for enginemen and firemen, and a vision of not less than 20/40 with the same conditions for

others engaged in operating trains; and for entrance to the first class a vision of 20/20 in each eye, without glasses, and for the second class a vision of 20/20 in one eye, and in the other not less than 20/40 without glasses.

There is a decided diminution in the acuteness of vision from fatigue, especially after long, hard runs, and at night. For this reason the vision should be tested when the man is not fatigued, and the standard should be kept up to such a level that when his vision is temporarily diminished in consequence of his work his sight will nevertheless remain above the amount which will enable him to do his work safely.

The test types are published by the Rand Avery Supply Company, Franklin Street, Boston, for $1 a set. The tagged worsteds are prepared by Miller & Weltch, 38 West Street, Boston, for $5 a set. The lantern is made by Peter Gray, Marshall Street, Boston, for $12.

The lantern is made of japanned tin and stands about a foot high; it carries on its front two discs of brass, A and B. The upper disc is arranged as a diaphragm with a series of holes, the smallest being 5-64 of an inch (2 mm.) in diameter, which at 20 feet would subtend a visual angle of one minute, and would correspond to the apparent size of an ordinary switch light lens when seen at a distance of 1,500 feet; the other holes correspond to the width of the different parts of the test-card letters. At C on both the upper and lower discs there is a shield which prevents the person being examined from seeing the holes in the discs behind the shields in which translucent letters for the upper disc and numbers for the lower disc are placed. These letters and numbers are lighted by the lantern in such a way that the examiner can see what color is being shown, or opening used, and make note of them, and the name of the color given by the person examined. The lower disc has 11 colored glasses and one vacant space. The colors are: 4 reds of different shades and intensities, made by combining two shades of red glass with London smoke glass; 3 greens, 2 yellows, and a blue. These colors correspond to those adopted on the Eastern District of the N. Y., N. H. & H.

R. R., where they now use red for danger, green for safety, yellow for the distant signal, and blue for car repairers and spacing signal. The light from the lantern shines through the glass

LANTERN FOR TESTING COLOR PERCEPTION.

placed in front of the center of the lantern, and by revolving the lower disc a series of colors can be shown, which should be named as shown. The lantern should be placed 20 feet from the person examined, and on a level with his head.

I am now making an improvement on this lantern, in which the lower disc will contain the colored glasses, the upper disc the modifying glasses, and a separate diaphragm with holes will be introduced between the discs to change the size of the area of colored light. This arrangement will allow a much greater number of changes of color and intensity than can be made with the present lantern.

DISCUSSION.

DR. STANDISH. — I would like to ask Dr. Williams a question. He just said that a man who wore glasses was not a desirable man to have on the engine. If he goes on at 20 as fireman and then at 44 loses his vision as a result of the development of a latent hypermetropia it is something of an injustice to drop him. Is it not possible to reject a man who shows hypermetropia by retinoscopy and other objective tests?

DR. WILLIAMS. — In answer I will quote from the instructions in effect on the road (reading). In other words, they will not take a new man into their engine service who shows that he has at least two diopters of hypermetropia, as tested by his ability to read the 20-foot test letters at 20 feet through a convex glass of 2 diopters.

DR. HOLT. — I had a talk with Dr. Williams two years ago about this, and tested quite a number of young men applying for positions on the road in that manner, and found that they were often unable to read anywhere near normal with the plus 2 glass, and yet with the skiascope I could demonstrate at least 4 diopters of hypermetropia, so I do not believe that will prove a very reliable test.

DR. WILLIAMS. — What vision had they without glasses?

DR. HOLT. — They had normal vision, and with plus 2 diopters they could not read more than 20/40. In regard to the color tests, I have not found any who passed the worsted test that did not pass the lantern test. They may call the light in the lantern blue instead of green.

DR. WILLIAMS. — It would not be fair to call that a defect, because in railway service many of the greens have a bluish shade, but are taken because with the yellow light of the kerosene lamp they give a good green. With this lantern you can get a bluish green or a yellowish green according as the glasses are rotated in front of the light, and greens and reds can be shown

which have different degrees of intensity. If a man calls a green light blue it is not a serious mistake and would not get him into trouble with railroad signals.

DR. RANDOLPH. — I can endorse very highly Dr. Williams' system of cards. It is astonishing to find how many railroad men read 20/20 and yet cannot read 20/40 on another card. Two years ago I induced the B. & O. R. R. to adopt this card system, and we found that many responsible positions were filled by men who had not more than 20/40 vision.

DR. MITTENDORF. — Another great advantage of these test types is that the letters are not surrounded by the little squares that appear on so many of the cards. They are so marked in some instances as to obscure the letters.

DR. WILLIAMS. — These cards have been in use on the Burlington System for about ten years, and are now also used on the Baltimore & Ohio, the Maine Central, Atlantic Coast Line, and some other roads.

DR. CARMALT. — This has been very interesting to me, because nearly 20 years ago I went over the same thing. The State of Connecticut passed a law requiring examinations of railroad employes. Exactly the very things Dr. Williams has described occurred to me in these examinations, and except for the time that has elapsed I could almost think that one of the cases he reports is an engineer whom I rejected and who was given a certificate afterwards by the Board of Health because he had not made any mistakes on the road in several years' service. That man failed absolutely in the original Holmgren test. He was given another examination by the same test some weeks afterwards and passed without flagrant error. Later I learned that he had procured a set of worsteds from Whitney, and his wife had coached him for the test, which he made sufficiently well before the Board of Health to have my certificate overruled. This shows that these men can educate themselves up to a certain point, and the Holmgren test, which I regard as altogether the most reliable, must be studied carefully.

I would like to ask, however, how many men having failed on the Holmgren test can pass the lantern test. Having failed on the Holmgren test, will they do any better with the lights or will they do worse?

DR. WILLIAMS. — I am very glad that Dr. Carmalt asked that question, and the case he refers to shows the need of using

both tests. I examined a man two weeks ago who hardly made any mistakes with the lantern, but he was enough off to be suspicious; when tested with the worsteds he showed serious defect in his color perception. On the other hand, as I have stated in my paper, you may have cases where they will pass the worsted test without selecting a single confusion color, but when tested with the lantern will show a very dangerous amount of defective color perception. In order to be safe it is necessary to use both the test with worsteds and with colored lights, having no names used with the worsteds, and having names given for the lights. I will mention one other case to add to the number of cases already recorded where defects of color sense have led to fatal results: A fireman on one of our large railroads was examined for promotion and failed on account of defective color perception. He left the service and applied for a position as engineer on a southern road where no test for color sense was required, and was given an engine on the strength of his previous record as fireman. He made two runs as engineer, and on his second trip he ran past a red signal, wrecked his train and was killed. The previous record of this case shows the cause of this wreck, but in many of these cases where no examination has been made before the accident it is never known what caused the trouble. This case only emphasizes the fact that men with defective color sense are dangerous men in positions where they must quickly distinguish the colors of signals, and that the tests to be used for the examination of these men must be such as will surely detect all the dangerous cases.

Dr. Carmalt. — In the case I spoke of in Connecticut, when the Board received my report enough influence was brought to bear on the lay members to insist that the men should have what they called " a practical test," on the ground that these men knew nothing about colored worsted but did know their signals. I improvised a hasty scheme (for my time was limited), which was not so good as this of Dr. Williams, but on the same lines, and in every case where the men failed on the worsted test they failed with the lantern test also. In the case of the engineer just referred to I was directed to try the flag test. We put him at a distance of 80 rods, more or less, and I played a little trick on them in perfect safety. I had the flags waved in a vacant lot, which, however, was banked in the rear by a dull red brick wall. This engineer was very much excited, of course, as one naturally would, feeling that his position on the road was at stake, and I appreciated all the time that it was hardly a fair test for him on

account of his nervous condition. The flags were waved, the red, green, and white, dirty, just as taken from the end of the train, and while they could be seen perfectly well by all the bystanders he made all sorts of mistakes. They had tried to stake the whole thing on this man on account of his good record on the road, but after this exhibition the officials in charge felt satisfied with the Holmgren test, and so expressed themselves to me, though they didn't dare state so in public.

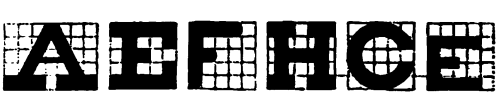
I am very glad that this thing is being kept up by the companies who now feel the responsibility for it themselves, for while it was a matter of law there was no end of trouble in carrying it out. I agree entirely with Dr. Williams in regard to the question of these older men wearing spectacles. As I get up in years the use of spectacles becomes more and more a necessity, and the difficulties in storm and in smoke are so great that I am satisfied that it would be a danger to the community to allow them to wear spectacles on the train, for they take them off when they become clouded and then of course they cannot see. As to examinations by the general physician, of course we all know what that amounts to. There is a physician in New Haven who has the run of the engine houses and gives a large number of certificates, but I am not sure that he is not color blind himself, from the gross ignorance he displays when talking on the matter.

Dr. Randall. — I would like to bring up two points, one is that while the companies as well as the law-givers have been now brought to see the value of these tests, it is well to lay stress upon the necessity of satisfying the men. That is a point which Thomson always tries for, in that he has the Holmgren test made before a group of the men, who sit as a jury, as it were, on the man being examined. They think it is a great pity when a colleague is turned down; but they are all quite sure that they do not want that man, who matches reds with greens, to run a train either before or behind theirs.

Further, I would like to split some hairs, notwithstanding that I heard the applause which greeted the proposition to obliterate the squares about the letters. They have great value in continually showing the principle — often violated — upon which Snellen's letters are formed. They should never obscure their clearness. I do not want to find any fault with the accuracy of these letters, because I assume that they are correct; but at the same time, following Dr. John Green, who first employed this simple Gothic text, we know that it is not an accurate test when the letter has the five-minute angle. Dr. Wallace adopted a four-

minute angle as empirically accurate, but that is not a Snellen test. The Snellen test lies not only in the size of the letter with its one-minute parts, but in the presence of interspaces of one minute, which are the real tests of vision. Helmholtz has proved that the test is really about 50 seconds for wires of moderate length, and we know that for Snellen's Roman block letter the 60 seconds is a very good test when the principle of interspaces is strictly applied. There is nothing of that sort here except for instance at points where we have one minute intervening between the horizontal black marks of the E. The strokes subtend an angle of one minute at the proper distance, but the other element which should make up the letter is not attended to in this type and is overlooked in a large number of test-types that are made. Hence the wisdom of adopting Dr. Green's letter having half squares to expand the head or foot, where irradiation would impair its form, instead of the full squares of Snellen's original type, since it enables us to rightly use most of the alphabet without having to greatly vary the size, as Dr. Dennett has done in order to equalize their legibility. It is a much more gross error in many cases than that which I find also present in a good many test letters, in that men have taken for the height of their letter the tangent of five minutes at the required distance. The proper thing is twice the tangent of one-half the angle, and that makes a difference of several millimeters in the size of the larger letters so that the 100-meter letters may really be seen at 107 meters.

When we come to the semaphore arms it is to be expected that those corresponding to 20 feet should be seen at 30 or 35 feet more than are the less simple "haken" of the "illiterate tests." On the other hand, if we employ dots, like Burkhardt's, we must increase the angle to 2.15 minutes to have them rightly differentiated, just as we found Snellen's dots marked L a fair test at 20 feet.



The A of Snellen's chart, seven minutes in breadth — only a few letters, such as E, suiting construction with whole blocks at the feet, etc.: in Green's type irradiation does not spoil the letter, as in the too simple F, but the half-blocks, as in H, complicate sufficiently to furnish the desired one-minute interspaces. Omission of such adjuncts may also lose the characteristics of the letters, as in the broken circle, which is not an O, nor, for lack of a head-block, a C; while the Gothic letters are too easy, unless some are reduced to even less than the four minutes of Wallace's E.

DR. DENNETT. — When Dr. Williams stated the difference

between the lines of type in common use for the 20-foot scale I noticed that the difference which he stated was less than the difference which exists between different letters of the same alphabet. Ten or twelve years ago I made some examinations and sent a little card to the members of this society on which the whole alphabet was reduced to the proper scale. The B was nearly half as large again as some of the other letters. The B and S were the large letters and the T a small one. There was at the time a set of test types gotten up in which the letters were made according to a scale of this kind, but the test types, were not good because the engraving was not well done. Whether we take the Snellen letters or the card that Dr. Williams showed, or whatever kind of types we use, we will not get the same results for all letters for their comparative visibility has not been very satisfactorily measured as yet.

DR. CARMALT. — I have seen in the papers that there has been a change made in the color signals on the New Haven road. Is that correct? Has blue been substituted for green?

DR. WILLIAMS. — No; green has been adopted as a safety signal instead of white on the Eastern District, east of New London. They have had some trouble with white as a safety signal, and once a white light in a house was mistaken for a safety signal when it showed in the position that the red signal, whose light had been blown out, would have occupied. They now use red for danger, green for safety, and yellow for the distant signal in place of green. I am glad Dr. Randall has brought out the point in regard to the shape of the Snellen letters. I first had the letters for my cards drawn of the same shape as the Snellen letters, but then changed to the Gothic type of letter because it was less confusing and resembled more closely the appearance of the signals with the semaphore arms. Another point with regard to the lantern tests is that it is necessary to have a means of altering the intensity of the light received from the lantern, for men with defective color-sense will learn to distinguish between the red and green lights by their difference of intensity, and in order to detect these cases it is essential to have a lantern arranged so as to change the intensity of the color without changing the kind of color.

DR. MITTENDORF. — What I protested against was not so much the presence of the lines as their varying thickness. In some of the test types there are very delicate lines, while in some

of the newer cards they are so thick that they tend to obscure the letters.

In regard to Dr. Carmalt's experience of having the men learn the colors at home, I have had a man come with his little bag of colors and say, "Now, Doctor, I know the colors perfectly." There were no confusion colors among them, but when I asked him to select from my bag he and his wife were horrified at his mistakes.

There is one great danger in wearing glasses for the correction of ametropia, and that is the fact that as soon as it begins to get dusk the lens absorbs enough light to make vision uncomfortable and they prefer to remove them. We know that when we go into a dark room we have to take our glasses off because they absorb the little bit of light which is there.

DR. WADSWORTH. — I would like to say a word about the statement made by Dr. Carmalt that the engineer had learned the colors so that he could pass the test fairly well. A friend of mine was told by an officer of the navy since the Spanish War that he had recently come up for promotion and was thrown on his color vision. He said he had shut himself up with his wife for some weeks to study the worsteds, and learned them sufficiently well to pass the examination and get his promotion. I had doubted whether this was true or not, but Dr. Carmalt's experience makes it perhaps not impossible.

DR. CARMALT. — I have known of several instances, Mr. President, in which it was done. I have a friend who acknowledges color blindness and yet can teach himself to recognize any color.

DR. MITTENDORF. — My experience is quite different. I have seen men who tried to learn the colors, but they never succeeded in passing my examination.

DR. HOLT. — My experience coincides with that of Dr. Mittendorf.

DOUBLE NEEDLE INTENDED TO FACILITATE THE DISCISSION OF SECONDARY CATARACT.

BY F. BULLER, M.D.,
MONTREAL, CAN.

Discission of the capsule for the betterment of vision, after otherwise successful cataract operations, presents so many difficulties and dangers that any genuine improvement in the technique of removing or displacing an obstructing capsule cannot fail to be appreciated.

The dangers are obviously of a twofold character.

First. From wound infection through the cornea and subsequent panophthalmitis.

Second. From cyclitic complications involving the capsule, the vitreous, the iris, and ciliary body in greater or less degree, from a mere transient irritation to a most intense and virulent irido-cyclitis. Traction on the ciliary region, or too much manipulation seems to be the exciting cause of these complications.

I suppose we have all seen eyes lost or irreparably damaged through either or both of these unfortunate sequels.

Besides this, the attempt to secure a properly situated and sufficiently large aperture, may be frustrated by obstacles that cannot be accurately estimated or effectually overcome; the divided capsule falls back into place, having a mere slit, or some elusive band mocks every effort to get it out of the way, to the unspeakable worry and annoyance of the operator.

Direct wound infection may be obviated by antiseptic precautions, especially if the needle puncture is made at or near the sclero-corneal junction.

In pre-antiseptic days I have seen wound infection suddenly appear in a corneal puncture, and develop into panophthalmitis, although, for several days, everything seemed to be going on well. This can probably be accounted for through bruising of the corneal wound by wide excursions of the needle. This danger is eliminated by peripheral punctures.

Excessive reaction and severe plastic irido-cyclitis I have

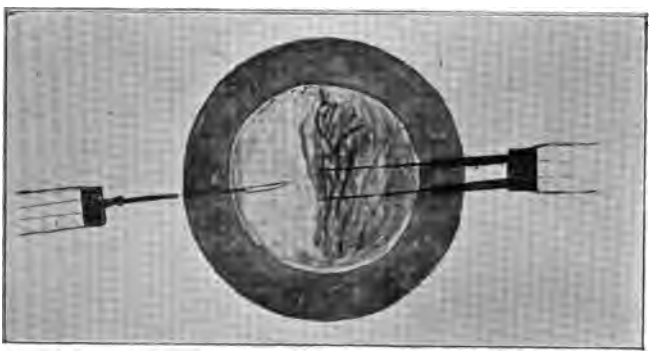
rarely seen, except when the operation was undertaken before the eye had entirely recovered from the irritability which follows the original operation (extraction), and I believe will hardly occur if a long period of rest has intervened, and the operation is discreetly performed. For this reason I seldom interfere with the capsule for several months after the extraction. Unfortunately, during this interval the capsule often becomes so dense and intractable that needling fails of its object though the mischances referred to in the third category.

Here, then, we are confronted with the difficulty of obtaining a sufficiently large or properly situated aperture, and with the danger of excessive traction on the ciliary region. For many years I have been trying to discover some effective means of overcoming these obstacles to success in manipulating toughened capsules, and the instrument I now present for your consideration is the outcome of studies in this direction.

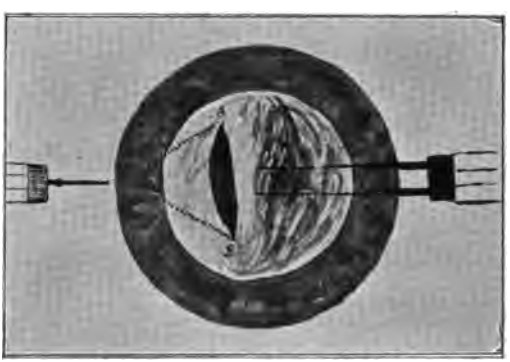
If the capsule were tense and uniformly tense in every direction, discission with a fine, exquisitely sharp knife-needle would be easy enough, and, as a matter of fact, a single narrow slit can nearly always be made quite readily, but when a cross cut is now attempted on the relaxed membrane, it is quite another affair.

This is just where the double needle comes in. I will endeavor to describe how it is used. First. The pupil is dilated, if possible, with atropine. Then, a careful inspection is made by focal illumination to find the weakest and the strongest parts of the capsule to be divided, bearing in mind that the aperture to be made must be, as nearly as possible, central. The usual essential preliminaries of cocaine, anaesthesia, and asepsis need not be described.

The various steps of the operation are, perhaps, best illustrated by the four diagrams here shown. The first shows the double needle passed steeply through the cornea at any convenient point down to the central edge of the denser portion of capsule to be divided, also the Knapp and cutting needle passed through the sclero-corneal junction to the line of its first incision, through the thinner part to be first divided.



No. 1.



No. 2.

The second shows this first incision made by a single sweep of the blade from the point A to the point B.

The third shows the second incision made by passing the cutting needle between the limbs of the double needle, and cutting the dense capsule, steadied by the latter, from the point C to the point D. This also is accomplished most effectually by a single sweep of the Knapp's needle.

The double needle is to be withdrawn first, and then the cutting needle. This completes the operation.

I have performed this operation about a dozen times, always with the most gratifying results.

Only in one case, the second incision failed to divide completely from C to D, because the points of the double needle were a little too far from the edge of a dense band near D, which tore away from the points of the needle as a narrow string, and could not be divided.

On one other occasion I used a Weeks' sickle pointed needle, and failed, owing to escape of aqueous through its puncture.

I say the results were most gratifying for the following reasons:

1. A large, clear central aperture was obtained.
2. There was practically no traction on the zonule.
3. In no case was there more than a most trivial reaction, which entirely disappeared within two or three days. This I attribute to the absence of traction and to the nature of the corneal wounds.

An ordinary discission needle passed through the cornea at any point considerably removed from the periphery, and made to perform wide excursions, necessarily leaves a bruised track, which forms a visible opacity for some time afterwards; such corneal wounds are always dangerous and readily become infected.

The double needles being very fine and making no excursions, leave no trace of injury, or liability to infection.

The peripheral situation of the puncture made by the cutting needle renders its excursions harmless to the cornea.

It is true that the operation makes three wounds instead of one or two, but this cannot be urged as an objection if, as I claim, the three wounds inflict no material injury, and are not associated

with the dangers which beset all other methods of discission. I do not mean to imply that this operation is of universal applicability. Very thin capsules may be satisfactorily divided by using a single cutting needle. Those of unusual density, especially if associated with iritic adhesions, may require iridectomy or some similar procedure, but, for the larger number, I believe the method I have described with the double needle will be found most satisfactory.

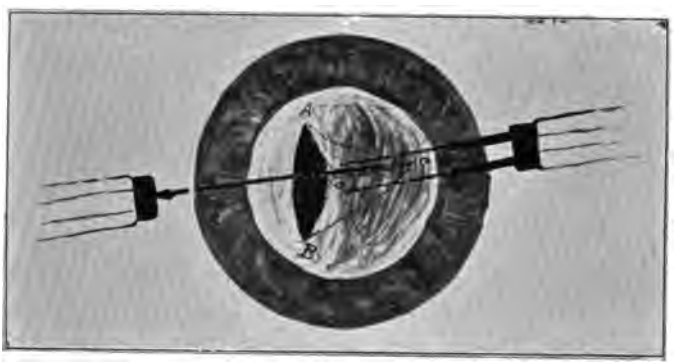
The needle may be obtained from Messrs. Tiemann & Co. To be perfect, the needles must be exactly parallel, and no more than 0.25 mm. in diameter, and exquisitely sharp.

I am having another pattern made exactly the same, except that the points of the two needles are curved on edge at the tip.

DISCUSSION.

DR. STANDISH. — I would like to ask if there is any difficulty experienced in introducing this double needle. Some years ago Dr. Bradford of Boston devised a similar instrument. I have one of them, and have many times tried to use it, but the difficulty has been that it is hard to get both needles entered through the cornea, and especially to have both cut through the capsule without pushing it before the instrument. Equal pressure can only be made with great difficulty and, therefore, one needle will enter and the other will not. I have not seen this instrument of Dr. Buller's, but the one I refer to I abandoned long ago. It seems to me, also, that in making discission with a peripheral entry we are deprived of the advantage of the cutting edge of the knife In order to get a good, clean cut through the capsule we must have as near a perpendicular entrance to the capsule as possible, and not have the scar subsequently interfere with vision. I think that the deferring of a secondary operation for three months oftentimes greatly increases the difficulty of the operation, and, moreover, that it increases the difficulties out of proportion to the risk incurred in operating as soon as possible after the cataract extraction. I have had cases of iritis following extraction in which an early capsulotomy caused a subsidence of the iritis, a result which, in some cases is highly desirable, although it is true in most cases, it is probably advisable to wait until the eye quiets down.

DR. BULLER. — I may say that with the needle I show you here, I have not had the slightest difficulty in penetrating the



No. 3.

No. 4.

Shows section of cataract completed.

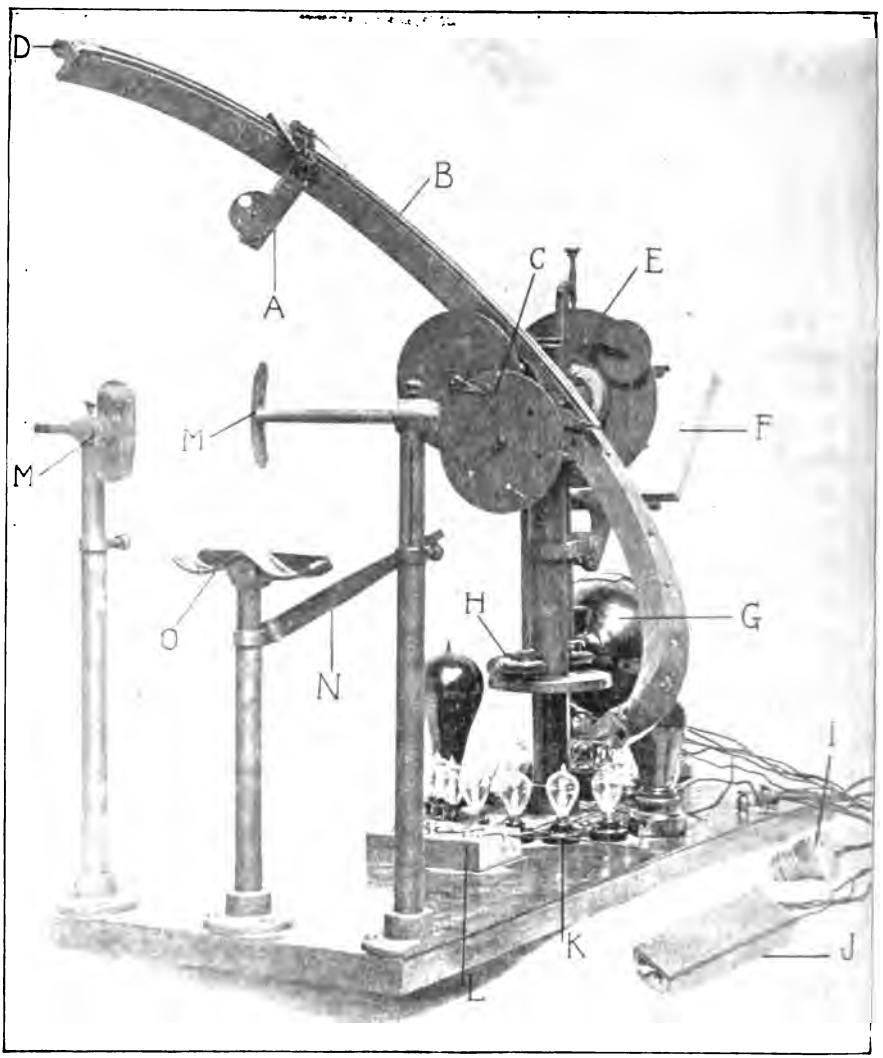
This Double Needle is manufactured and can be had of George Tiemann & Co., 107 Park Row, New York City.

cornea, and it is not necessary, and I do not think it is really advisable to cut the capsule with the points of the needle; they are pressed upon it gently in order to steady it. With regard to the peripheral puncture by the Knapp needle, that is designed for cutting through the thin parts of the capsule, and then making the cross-cut between the blades of the double needle.

A MODIFIED PERIMETER

By DR. CHARLES H. WILLIAMS,
BOSTON, MASS.

The accompanying cut shows a registering perimeter in which two small incandescent telephone lamps are used, one as a point of fixation at C, the other to determine the limits of the field of vision A. The light at A can be moved back and forth along the arc B by means of the reversible electric motor G, whose motion is controlled by the switch J, held in the hand of the examiner. The intensity of light which these two lamps give is controlled by the switch at L, which throws more or less of the lamps at K into the circuit; these lamps at K do not glow, they simply serve to reduce the current passing through the lamps at C and A by fixed amounts, so that if it is desired to test the field of vision with a light of given intensity, and afterward by one of less intensity, the amount of light can be varied as desired. If the field is to be tested after an interval of some months, as in cases of suspected advancing atrophy of the optic nerve, the examination can be made with exactly the same intensity of the test lights on the second trial as were used at the first. With these lamps the light remains constant no matter in what part of the arc it stands, or in what position the arc may be placed, whereas, with a bit of paper, or other test object as commonly used, it is impossible to have this paper seen equally illuminated in all positions. The head of the person to be examined rests with the chin on the support O, and the side-pieces, M, can then be adjusted so as to rest against the temples, and thus avoid lateral displacement of the head and eye. When placing a patient in position the arm N is set upright, and the eye is put in line with the axis of the in-



PERIMETER.

strument by having the head adjusted so as to bring the eye just above the top of the arm N, which can then be turned aside so as not to interfere with taking the field of vision. The motion is transmitted from the motor G to the light A by means of a worm-gear at H, which drives a vertical shaft, to the top of which is fastened a bevel-gear; this moves a double-toothed wheel which plays freely on the axis of the instrument, the teeth on the outside of this wheel engage in the teeth of a rack which runs in a groove cut in the arc, the end of which is shown at D, and to the end of this rack is fastened the metal tube which carries the light A. On the face of this tube is fastened a revolving diaphragm to vary the size of the illuminated area shown, and behind the diaphragm pieces of colored glass can be inserted when it is desired to test the field for color. At C are two discs, one with holes, as before the moving light, the other with colored glasses so that in testing the field for red, green, blue, or white, the same color can be shown at the fixation point and in the movable light on the arc. At E is a brass disc fastened to the axis of the instrument, so that it revolves with the arc, and a catch at the top of this disc holds the arc in any meridian. On the back of the disc E is a steel point which is so geared to the motor that it moves exactly as the light A moves, but with a reduced amplitude of motion. When the limit of the field of vision in any meridian is found by moving the light A from the end of the arc toward the center until it is visible, the motion of the light is stopped by the switch J, and the chart F, placed on a hinged board, is brought up against the point which makes a perforation in the chart, showing the position of the light on that meridian at the edge of the field of vision. After the examination is completed these perforations on the various meridians can be connected by a pencil line showing the extent of the visual field. The plug I can be screwed into the socket of any electric light having a constant current of the usual strength of 110 volts, and this street current can be used to operate the apparatus. The two larger incandescent lamps, painted black, at the end of the series at K, are introduced to reduce the strength of the street current to a point where it can be used in the other low voltage lamps of the instrument. In using the in-

strument the operator stands behind it with the switch J in his hand, he is thus able to watch the eye of the patient, and at the same time have absolute control of the motion of the light on the arc; in this way he can be sure that the patient does not vary the position of his eye while the test in any meridian is being made. Although the instrument may look complicated it is really very simple in its action and easy to operate, and a field of vision can be taken more quickly and accurately with it than with the perimeters in ordinary use. The speed of the light on the arc can be regulated by a rheostat in the base of the motor.

A METHOD OF CONVERTING THE ALTERNATING ELECTRICAL CURRENT FOR USE IN CONNECTION WITH THE JOHNSON MAGNET.

By WALTER B. JOHNSON, M.D.,

PATERSON, N. J.

The portable electro magnet devised by the writer, and described in the May number of Knapp's Archives, is only of use in connection with a direct electric current of 110 or 120 volts, and consumes one-half ampere of current.

Municipal lighting in many cities is accomplished entirely by the alternating current either 104 or 50 volts.

The means of converting an alternating current into a direct current is essential to the adoption of the magnet for general use.

The following method is entirely successful: A one-quarter horse power fan motor for the alternating current adapted to the alternating current to be used is fitted with a pulley which is to be belted at a distance of three feet to a pulley attached to a one-sixth horse fan motor made for the direct 110 or 120 volt Edison current. The speed of the motors must be the same; the Edison motor by changing the leads acts as a generator and furnishes the one-half ampere of current at 110 volts necessary to fully saturate the core of the magnet.

The same result could be obtained by directly uniting the two magnet shafts. The motors and necessary belting and pulleys would cost about fifty dollars. The conversion of the alternating current for use in connection with the large magnets is much more expensive and cumbersome in consequence of the necessity of furnishing about 12 amperes of current, requiring a motor and generator of several horse power.

REPORT OF THREE CASES OF MAGNETIC EXTRACTION OF STEEL FROM THE EYEBALL THROUGH POINT OF ENTRANCE.

BY WALTER B. JOHNSON, M.D.,

PATERSON, N. J.

The extraction of foreign bodies in the eyeball, through the point of entrance, after injuries received from flying particles of steel or iron, has only been considered practicable since the introduction of powerful magnets.

In the three cases here reported the magnet devised by the writer and described in the May number of Knapp's Archives was used in the magnet operations.

CASE No. 1. C. D., age 26, laborer, May 22, 1899. While standing eight feet distant from two fellow workmen who were breaking steel bars he was struck in the right eye, he believed, by a piece of steel, which cut the eye and then fell to the floor. One hour and a half after the injury he applied for treatment. Examination disclosed a perforating wound in the ciliary region on the nasal side, about two lines in length. The ophthalmoscopic examination was negative in consequence of an extensive intraocular hemorrhage which entirely obscured the fundus. The tension of the eyeball was considerably reduced.

The ovoid tip of the magnet was held near the lips of the wound. The patient then complained of a sensation of pain as though pressure were made upon the eyeball. The pain increased as the magnet approached more nearly. After several

efforts the foreign body became engaged in the wound, which was indicated by movement of the eyeball in any direction as the line of magnetic attraction was changed by altering the position of the magnet. The long tip of the magnet placed within the lips of the wound elicited a distinct click. The ovoid tip was again used, and, after several efforts requiring considerable traction, the foreign body presented and was removed by forceps. The piece of steel as shown measures 3-16 of an inch long by 1-8 of an inch wide and 1-32 of an inch in thickness. It is very sharp-edged. The treatment consisted of rest in bed, application of iced cloths, and instillation of atropine. There was very little pain after the removal of the foreign body.

June 5th. The eyeball is normal in appearance and tension. There is a linear scar at the point of entrance. R. E. V. = 20/40.

The ophthalmoscope shows a large quantity of partially disorganized blood floating in the vitreous.

June 10th. The patient developed typhoid fever, which he still has. Rough tests at present indicate deterioration in the power of vision.

CASE NO. 2. O. K., age 48, machinist, June 2, 1899. The patient applied for treatment, stating that four days previously while chipping cast iron he was struck in the right eye by a flying piece of metal, which he believed had cut his eye and fallen to the floor. The injury was followed by severe and increasing pain and swelling. He had been advised that his eyeball was severely cut and inflamed, and enucleation was recommended.

June 2d. Was examined for the first time, four days after the injury. The lids were swollen, there was marked proptosis, conjunctival chemosis, and a penetrating horizontal wound in the lower third of the cornea; the anterior chamber was full of swollen lens matter, the tension of the eyeball was considerably increased, and the appearance and general symptoms indicated panophthalmitis. The corneal wound was seemingly partially closed. The ovoid tip of the magnet when placed near to the corneal wound caused sharp lancinating pain. After approaching the wound several times with the magnet the edge of the iron

could be seen. It was evidently too large to pass through the partially closed aperture.

The corneal wound was then enlarged with scissors, and upon again approaching the eye with the magnet tip the iron finally jumped out to it.

The iron removed is a crescent-shaped chip 1-4 of an inch long, 3-16 of an inch broad, and 1-16 of an inch thick in the center.

June 4th. The conjunctival chemosis has diminished, the lens matter presenting at the wound is in a semi-purulent condition, and that within the anterior chamber also has a distinctly yellowish cast. There is considerable muco-purulent discharge from the conjunctiva.

The patient suffered very little pain after the removal of the iron; the inflammation gradually subsided under constant iced cloth applications and atropine.

July 5th. The swelling and redness have almost entirely disappeared; the corneal wound slowly healed; the cicatricial line shows a tendency to contraction with slight sinking; the iris did not prolapse; the lens matter has gradually absorbed; from the point of injury to and within the pupil there is a deposit of unabsorbed lens matter and plastic lymph; the eyeball is somewhat soft, and the general appearance indicates possible subsequent atrophy. At present he has distinct shadow perception.

CASE NO. 3. J. M., age 29, blacksmith, June 13, 1899. The patient applied for treatment at St. Joseph's Hospital, stating that while holding a hammer which was being struck with a sledge he was struck in the right eye, he believed, by a flying piece of steel which he thought had entered and destroyed the eyeball.

On examination, four hours after the injury, there was slight sinking of the eyeball, a corneal wound vertical in direction, extending from the center of the cornea upward about one line past the limbus, the iris was torn at its junction and prolapsed, the lens capsule was ruptured, the steel could not be seen.

The ovoid tip of the magnet was used and immediately seized the foreign body; the traction was so great that the current was

turned off and the long tip of the magnet substituted; the edges of the wound were gently pushed past the edges of the foreign body with a bone spatula, the steel was easily removed, the prolapsed iris was excised. The shape of the piece extracted was triangular, about $\frac{3}{8}$ of an inch at its base and over $\frac{1}{8}$ of an inch from base to apex.

The treatment consisted of instillation of atropine and at times cocaine; the eye was kept quiet by the ordinary double eye shield over gauze pads. The day following the operation an extensive chemosis of the conjunctiva developed; the conjunctiva of the lower half of the eyeball was most affected and protruded between the lids; there was very little discharge; the eye was painful. This condition persisted for five days, the pain gradually subsiding after the third day. The corneal wound healed rapidly, the inflammatory engorgement decreased steadily during the two weeks following, and although the improvement was slow it was constant.

July 8th. There is still slight œdema of the upper eyelid; the patient can open the eye; the conjunctiva is uniformly reddened and somewhat swollen; there is lachrymation on exposure to light; the corneal wound is entirely healed, and the cornea is clear; there is considerable soft lens matter in the anterior chamber; the tension of the eyeball is slightly increased; the indications seem favorable to preservation of the eyeball.

DISCUSSION.

Dr. Howe. — In my experience I have had difficulty at one point, that is, after the magnet has touched the foreign body and brought it up to the wound. As the point of the magnet came out the foreign body has been scraped off, and it was almost impossible to reach it. I have sometimes overcome that by putting in a very fine pair of forceps. This, to me, has been a source of difficulty in the use of the magnet.

Dr. Rider. — I have had no experience in the removal of foreign bodies with the electro-magnet, but I saw a case this year which has an important bearing on the general subject of the removal of foreign bodies. I enucleated the eye of a workingman in which there was a single clean-cut wound of the cornea, a lacerated iris, and a badly injured lens. On dissecting the ex-

cised eye I found one piece of steel in the lens, another lying upon the ciliary body, while in the fundus was a third. Remember, the corneal wound of entrance was a single, small, clean cut. I have not had an opportunity to look up the literature of the subject as thoroughly as I could wish, but it must be exceedingly rare to find an eye containing three fragments with but a single clean-cut entrance wound. Nevertheless, it seems to me that such cases should be borne in mind, for if, in the present case, I had succeeded in removing one piece I might have stopped there, supposing that I had secured the whole cause of the trouble, while in reality the eye would still have contained two foreign bodies. The possible consequences of such an error are apparent.

DR. HOLT. — In regard to the difficulty referred to by Dr. Howe I would say that I have overcome this by having an assistant use the little hooks that come in Stevens' tenotomy case to separate the wound so the steel may slip out. I have had some thirty cases of removal of steel from the vitreous. I saw some of my first cases within a short time of the accident, and the steel was removed and nearly normal vision was preserved to the patient, which probably accounts for so many more coming to me. I know the objection made to this operation, that subsequently the eye would have to be removed. I have tried to keep the history of these cases, and so far as I can learn a large majority of them are in good condition now. In the later series of cases my experience has not been so good, because the eyes were more extensively injured and there had been a longer time after the accident before the steel was removed. I therefore have had to remove the eye in several cases on account of inflammation which led to softening of the eyeball. With this experience I do not see any objection to the operation if we take into consideration that the former practice was to remove eyes which had sustained such an accident. It is always advisable to try to remove the steel; failing in that, we can remove the eye afterward. It would seem that the magnet brought out by Dr. Johnson is an instrument of value in these operations and one that will be within the reach of all. It would seem difficult to me to attract the steel and make it come out of the opening made in its course inward even by this powerful magnet, for in nearly all of my operations I have made an opening in the inferior temporal quadrant through which to remove the steel. I have a case now under observation where after a severe injury, the steel being removed,

there will be no sight, but there is a good-looking eye which will apparently be of service for a long time.

DR. JOHNSON. — In regard to the remarks of Dr. Howe, I would say that with the Haab magnet, or with such a one as this, which is equally strong and has equal pulling strength, the questions of separating the edges of the wound in pulling the metal from the eye, or of the lips of the wound pulling the metal from the magnet, are not to be considered, as the magnet is not introduced into the eyeball. If the wound is recent and open and there is a tract between the point of location of the metal and the end of the magnet the metal will certainly be drawn to the opening by the strength of the magnet. In fact, I think the danger in the use of such strong magnets is that injury may be caused by too severe traction on the eyeball. I am quite sure that in the last case the seizing of the iron so strongly by the magnet, before it reached the eye, distorted the eyeball very suddenly and injuriously; the same result would occur with the Haab or any other strong magnet brought near the eye in that way. There is some danger in approaching the eye with a strong magnet, that more serious damage may be inflicted than already exists. The lines of magnetic force must directly follow the track of the foreign body after carefully determining the direction taken by the foreign body. I think it would be better to approach with the milder end of the magnet first. When the iron is small and has entered the vitreous I believe it would be better, if the removal were to be attempted at the point of entrance, to enlarge the opening before the magnet operation is commenced. It required in the first case reported a considerable amount of traction and a number of efforts to cause the steel to present at the opening and to effect its removal. I think if the opening had been a little enlarged much of the trauma which resulted from the efforts at the removal of the foreign body would have been prevented. I believe it would be proper in each instance, unless the foreign body presented easily, to slightly enlarge the opening. I think there is a great deal of advantage in removing the foreign body through the point of entrance, providing it is possible, as it seems to me the old method of making an incision through the sclera is simply adding another wound to the already injured eye. In cases where there is a large foreign body removed there seems to be danger of contraction of the scar and subsequent atrophy of the eyeball. I agree with Dr. Holt, however, that the first thing to do in these cases is to try to get the foreign body out. It should be removed instead of adopting the old procedure of waiting

until panophthalmitis has sufficiently developed to make the patient feel that he would like to have the eye enucleated. If the vision deteriorates afterwards the eyeball may still be useful for cosmetic purposes, or if indications point to possible sympathetic ophthalmia enucleation may be performed as a last resort.

DR. HARLAN. — An important point in the removal of foreign bodies by the magnet is that the operation should be done as soon as possible after the injury, before there is any exudation. I was struck with that some time ago in attempting to remove a foreign body that had been diagnosed by the X-rays, and, failing, I found after enucleating the eye that the foreign body had, after a few days in its position, been bound down by an exudation so that the magnet had no power over it. In the lens and vitreous this does not occur, but a foreign body lodged in the choroid may soon become so involved in cicatricial tissue that no magnet will liberate it.

CLINICAL MEASUREMENTS OF PUPILARY REACTION.

BY LUCIEN HOWE, M.D.,

BUFFALO, N. Y.

Whoever undertakes to examine the literature of pupilometry is soon impressed by three facts:

First. By the rather large number of ingenious and careful studies made, especially of late years, to determine the absolute size of the pupil.

Second. By the comparatively small number of studies to ascertain the frequency, the rapidity, or degree of variations in its size, or the causes which produce these variations.

Third. By the fact that while these methods of investigation are well adapted to laboratory experiment, they are of so little clinical value that practitioners have not yet availed themselves of them, to any extent, in spite of the importance of the symptomatology of the pupil. In a single paper it is only possible to indicate briefly, from the clinical standpoint, the various factors in the problem of pupilometry, and to refer to an instrument which

apparently is of some practical value as a pupilometer. In a subsequent paper, more detailed descriptions will be given as to the character and frequency of these movements of the pupil, thus shown.

In all measurements of the pupil, there are, of course, two aspects of the problem — the pupil and the instrument with which it is measured. The variations of the former and the imperfections of the latter constitute the difficulties presented. It should be remembered, of course, at the outset, that the absolute size of the pupil is of relatively little importance, varying as it does in different individuals, and being smaller in advanced life than in youth. Silberkuhl* has given us the latest and probably the best figures as to the average size, that is, in young people, from 15 to 20 years, four millimeters (4 1-10); in persons of fifty or more at three millimeters in diameter, while between 20 and 50 it varies from 3 6-10 to 3 1-10.

We have, therefore, to review briefly the four factors which produce changes in its size, even though in doing so it is necessary to recall facts already familiar. We naturally think first of variations due to intensity of illumination. That means, of course, that any measurements of the pupil, to be accurate, must have a definite relation to photometric standards. For very exact measurements a photometer is an undoubted necessity, but in Schirmer's article,† he says that "if the window be covered with two white curtains, which either alone or together can be drawn down, the amount of illumination can be sufficiently regulated." This is also sufficient for most of the clinical examinations made to determine whether or not the iris still retains a considerable amount of mobility.

A very convenient photometer also is the radiometer of Crook. Many years ago, it was suggested at this society that this instrument could serve as a photometer, and although it has since been ascertained that the radiometer is influenced by electrical waves, we have also learned more recently from Tesla of the identical behavior in many respects of light and electricity. so

* Graefe's Archiv. fur ophthalmologie, 1896, Vol. XLII, Abtheilung III, p. 179.
† Graefe's Archiv. fur ophthalmologie, 1894, Abtheilung V, p. 12.

that objections to the radiometer are of less weight than formerly.

As we know also that the iris contracts with all efforts at accommodation, let us next glance at the bearing of this upon measurements of the pupil. It is undoubtedly true that when an intelligent subject gives time and patience to the tests he can be taught to fix a distant object and then one nearer, at will, maintaining the accommodation thus for certain points only.

On the other hand, I am convinced that most persons not trained to such tests, practice what may be called unconscious accommodation, with accompanying variations of efforts at convergence. This unconscious accommodation has long been recognized, and reference to it, more or less complete, constantly appear in ophthalmological literature. In Graefe's Archives for 1894, there is an excellent article on accommodation and convergence by Alfred Graefe, in which this principle is well recognized, though I do not know of any complete study of the subject.

The existence of such unconscious efforts is shown by the almost constant changes in the size of the pupil visible under magnification, even after all other variable factors have been eliminated as completely as possible. Unconscious accommodation is also indicated by the varying, and therefore unreliable nature of our tests of convergence. These tests, either with the rod, phorometer, or other varieties of the prism, may show at one minute a latent convergence of a certain number of degrees, or again, at the end of a few days or hours or minutes, we may find the amount of muscular abnormality decidedly different. This is an important point, and influences our conclusion not only as to the mobility of the iris, but as to those obscure muscular conditions for which tenotomies were once more fashionable than at present. A third group of causes tending to vary the size of the pupil relates to the respiration and circulation. We know, of course, that the pupil dilates with deep inspiration, and that to a certain extent it is influenced by variation in the blood pressure. With a little care, however, an intelligent subject can be taught to breathe so regularly, that, barring pathological conditions of

the circulation, this group of causes can be eliminated as a factor in the variation of the size of the pupil.

A fourth factor includes what may be called the psychic causes. These are, naturally, more difficult to estimate than any other, unless it be, as just mentioned, our control over the tendency to accommodation and convergence. In an exhaustive monograph on the movements of the pupil by Leeser, as far back as 1881, he calls attention to the importance of this group of causes, showing how sudden fright will cause wide dilatation, and also the changes which take place in the more moderate dilatation when laughing. It is probable that these or other emotions vary the size of the pupil in a certain degree.

Having thus glanced hastily, as was necessary, at the four different factors which tend to change the size of the pupil, let us pass to the next part of the problem, that is, the instrument with which the pupil is measured.

Estimates of size are made, as we know, in a rough way, by holding a circular opening or a measure in front of the pupil and reading off the diameter (*Follin, Laurence*), or it may be measured by a reflecting prism (Schirmer* and Silberkuhl.) It was long ago discovered that the ophthalmometer was also an excellent pupilometer, but, as Du Bois Reymond has pointed out, that instrument can be used only when the light is strong, and consequently the pupil smaller and more immovable than normal.

The object of these methods is to determine only the absolute diameter, but while the studies in this direction have been careful and exact, the facts remain that the pupil is in almost constant motion, and the diameter at one instant is certain to change a few seconds later. As before remarked, therefore, the absolute size is of comparatively little importance, within certain limits, and our attention is directed principally to the number of the contractions within a certain time, their degree and their rapidity.

One of the earliest studies to determine the time required for pupilary contraction was made in 1869 by Dr. A. F. Arlt,† who attempted to measure the rapidity of accommodation, and con-

* Graefe's Archiv. fur ophthalmologie, Vol. LX, Abtheilung V.
† Graefe's Archiv. fur ophthalmologie, Vol. LXII, Abtheilung III.

sequently pupilary contraction. More recent studies on this point being by Seashore*, and others.

Bellarminoff† has measured not only the rapidity of the contractions but their degree and number within a certain time, and his apparatus is so ingenious as to deserve a word of description. He made use of an ordinary camera so constructed that after focusing the eye upon the ground glass plate he could remove this plate and place in its stead a diaphragm having a small vertical slit, behind which slit there was passed a roll of photographic film, operated by clockwork, very much as the film in the ordinary hand camera is rolled from one spool to another. As the pupil is black, therefore, when it was focused on the sensitive paper no image was photographed, but each contraction of the pupil made the black band seen through the vertical slit smaller from above downwards, and each dilation made it wider from above downwards, thus varying the width of the band photographed on the paper as it passed behind the slit. By this contrivance photographs were produced which showed not only the number of variations in the size of the pupil, but also their degree, with an exactness which had been impossible before.

These various methods are mentioned, and the last might be extended almost indefinitely, by citing other investigations, in order to show what has been the aim of work in this direction and also how little it is adapted to the needs of the ophthalmologist. For this reason especially it seems warrantable to call attention to a modification of a principle which, though mentioned last, is not the latest chronologically. By this method a magnifying glass is placed before the eye, thus giving a better view of each variation in the size of the pupil, and, also, a graduated scale is interposed between the magnifying glass and the pupil. The simplest form of this is shown in such crude instruments as were proposed by Carl Ferge and others.

Gradually these become more perfect. Of late the scale has been adapted to a large horizontal microscope, which is here pre-

* Graefe's Archiv. fur ophthalmologie, Vol. XV, Abtheilung I.
† Studies from the Yale Psychological Laboratory, 1892, 1893.

sented, which apparently furnishes us with as convenient and complete a pupilometer as has yet been found. In going over the literature of the subject, I find that in 1882 Schadow* of Crefeld has an article on the physiological movements of the iris, in which he mentions the use of an instrument constructed somewhat on this principle, and says that Prof. Cohlrausch of Wurtzburg had already constructed the pupilometer on the same principle in 1879. In the description which follows, however, it is evident that neither the instrument used by Cohlrausch† nor that employed by Schadow are as exact or reliable as is the pupilometer here mentioned. This instrument, which was devised by Mr. Henry L. De Zeng of Buffalo, was described as a whole in the New York *Medical Journal* of June 17th, and in that description mention was made incidentally of its use as a pupilometer.

It seems worth while, however, thus to call more special attention to its evident advantages in this respect.

For use as a pupilometer it is only necessary to place in the tube a micrometer scale, similar in principle to the ordinary micrometer eye piece of the microscope. With this, each variation of the iris is not only magnified, but its degree can be measured simply and easily. In order to obtain the best results it is well to have the patient rest the chin in his hands, the elbows in turn resting on the table. This position is sufficient to hold the head quite firmly.

Still better, however, is it when a firm upright bar is made fast to a table by a setscrew, the upper part of the bar bearing a headrest against which the forehead can be brought, while a piece of wood, supported in a convenient place for the teeth, is held firmly in the mouth by the patient, — this being the same principle as that utilized by Stevens in his tropometer.

Such a microscope, with the micrometer eye-piece, and with a good headrest, enables an observer to measure with ease and accuracy not only the size but the movements of the pupil in such a way as to be of real clinical value.

---

* Archiv. fur die Gesammte Physiologie des menchen und der Thiere Pfluger, 37, 1895.

† Graefe's Archives fur ophthalmologie, Vol. XXVIII, Abetheilung III.

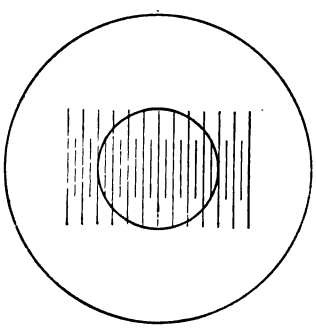


Diagram showing the appearance of the micrometer as seen with the horizontal microscope.

IS THERE A "HYPERMETROPIA ACQUISITA"?

BY B. ALEX. RANDALL, M.D.,

PHILADELPHIA, PENN.

There has been a long-standing tradition that near-sighted eyes improve with age by reason of flattening of the cornea, lens, or other refractive changes; and the natural corollary of this ascribes an increased hypermetropia to the eyes showing this form of refraction error, and the appearance of an acquired far-sight with advancing life in those originally emmetropic. Donders is in large measure the father of this view, since he states it and graphically shows it in his chart of the accommodation (Refraction of the Eye, p. 207), upon grounds not there given in detail; and Landolt has furthered the matter, also without data, by portraying in his scheme (Refraction and Accommodation of the Eye, p. 174), the growth of a hypermetropia of 2.25 D, instead of the 1/24 claimed by Donders. I have frequently called in question these views in discussing other phases of this general subject, but would like here explicitly to challenge their correctness, and to ask for the production of any competent evidence in their support.

We all know that myopia grows less troublesome as age advances; but it is highly probable that this is due as much to lessened desire for keen distant vision as the bodily activity declines, as to the optical fact that narrowing of the pupil cuts off the more aberrant rays, and tends to give habitually the sharper vision which in good light every myope can obtain through a pinhole. The changes in the index of refraction of the lens-layers, which Landolt so confidently cites, are as hypothetical and lacking of scientific basis as the more popular view that the cornea flattens. Surely, these are matters too easy of proof to be thus gratuitously assumed, however plausibly. Granted that the individuals from the 55th to the 80th year of age scientifically studied must be limited in number, and that only a few of them will escape cataractous swelling of the lens which will increase in-

stead of decreasing their refraction; the burden of proof is still fairly upon those who uphold the occurrence of "hypermetropia acquisita." The proved changes in the crystaline lens throughout childhood and maturity are all in the direction of increasing disparity in the refractive index of its layers — almost homogeneous in infancy; surely, the mere exaggerated reflex of the senile lens is insufficient to prove so much as Landolt would have us accept, even if not wholly ascribable to demonstrated changes in the capsule. I have elsewhere (TRANS. AM. OPHTH. SOC., 1890, p. , Kl. Monatsblatter, Feb., 1892, etc.), touched upon this in relation to the development of the child's eye from a length which under adult conditions of the refractive media would comport with H=35 D, and shown its bearing upon the question of change of the refraction in early life. Winow has measured in a few instances a less than average curvature of the anterior surface of the senile lens, and v. Jæger and Priestly Smith have shown that the lens continues its growth throughout life. This increased diameter might explain such increased radius of curvature; yet this is a process that has been nearly constant, but lessens rather than gains with age. While it is probable that all of the older parts of the lens have become harder and more compact, and may, therefore, have an index more nearly approaching that of the nucleus, it is evident that the new cortical material cannot share in the process; while the decreased depth of the anterior chamber might more than compensate for any lessened refraction of the lens by removing it farther from the retina.

The question of the change which Donders claimed to have observed in clinical cases deserves respectful consideration; yet it can hardly be upheld upon his mere early statement that he had satisfied himself of its correctness. Too many niceties of refraction-study have since come into general use to leave the work of 1864 often above challenge; and we have no evidence that in these cases Donders employed the exacting methods of which he wrote me as to his study of accommodation and its "tone." It is significant that this acquired hypermetropia is not claimed to become recognizable until after the accommodative power has be-

come inadequate for many purposes — after fifty, according to Landolt — and reaches its maximum with the final disappearance of all accommodation. Any argument with regard to this is as strictly applicable to many of the juvenile or adult cases in which paresis or mere bodily weakness cuts down the focussing power much below the normal, and brings temporary asthenopia from ametropia previously and later unnoticed.

In these days no real argument would probably be attempted, except upon the basis of refraction measurements made under a mydriatic; and cases innumerable can be cited in which exhaustive efforts to get at the real refraction under atropin or other cycloplegics have been found to have revealed less than the hypermetropia later manifest. Thus in a patient recently seen, the

$$\begin{cases} \text{O. D.} + 1.50\ s\bigcirc + 2.50\ c\ ax\ 90^\circ \\ \text{O. S.} + 1.50\ s\bigcirc + 2.50\ c\ ax\ 135^\circ \end{cases}$$

given under full mydriasis at fifty-four, had to be increased at sixty-eight to $\begin{cases} \text{O. D.} + 3. \ s\bigcirc + 2.50\ c\ ax\ 90^\circ \\ \text{O. S.} + 2.25\ s\bigcirc + 2.25\ c\ ax\ 135^\circ \end{cases}$ to correct the manifest. Unfortunately for the theory, such cases prove too much, for, in elderly people, the decrease in the refraction often far outstrips in rapidity and extent even Landolt's claims; while in young persons where no presumption existed that spasm was present, it is common enough to undermine most of the supposed demonstration. Mydriatics are probably more used in Philadelphia than anywhere else, and some very careful studies of them have been made there. Their value and frequent necessity have been amply shown; but so, too, has their fallibility. No reasonable man can hold, that, because his chosen mydriatic has been used long and freely, his results are unimpeachable; and with those cases requiring remeasurement, he has been fortunate, if able himself to make any needful correction, and not have it superciliously done by some colleague. I have generally found my work to hold good, and repeatedly have exactly confirmed my findings of nearly twenty years ago; yet, I can at times make manifest measurements that show serious error made under vigorous use of a mydriatic only a short time before. We meet at times reports of long series of cases where the findings under one

mydriatic were invariably confirmed by continued mydriasis with another of adequate strength. The later observation can hardly have been up to the mark. I have done too much of this work with Dr. Risley and independently to be able readily to accept results so contrary to my experience.

Used as a practical aid of great importance, any of the mydriatics can give us in most cases accurate results — not infrequently identical with the manifest refraction found before and after its use, although generally uncovering more or less of latent error. While we cannot for a moment admit the claim sometimes made, that any false and fictitious condition of the refraction is disclosed by the mydriatic (care being taken, of course, that the same region of the cornea and the same axis are measured), we must as scrupulously beware of the opposite error of assuming infallible completeness for its revelation. It is perfectly possible that the crystaline lens may be temporarily deformed by long-continued accommodative spasm, and total paralysis of the ciliary muscle may leave some latent hypermetropia or astigmatism concealed by this lens-condition. More often we have incompleteness of paralysis, which may be evident, yet apparently inconsiderable when really notable in amount. If one fails to meet these cases, it is probably because they have passed into other hands; for every thousand of refraction-measurements must contain dozens of them, which the most scrupulous primary care cannot wholly exclude. I have had dozens of them coming from thoroughly careful and competent men, and, doubtless, out of my practice have furnished to others more than I have had opportunity myself to recorrect.

With these facts in mind, my query seems fully pertinent: Have we reliable data for the assumption of a "hypermetropia acquisita"? To me, the evidence is far from satisfying; and I believe it is the part of wisdom and not a merely captious criticism if we ascribe to faulty earlier measurements the apparent instances of decreased refraction, whether met with in young or old.

DISCUSSION.

DR. HOLT. — In talking with Dr. Randall last night upon this subject I was reminded that, following the teachings of Dr.

Agnew, I used a one-per-cent. solution of sulphate of atropine for a week or ten days at a time to test eyes for the purpose of fitting lenses. As these cases have come back to me, ten and fifteen years afterward, I have found, in some instances, more hypermetropia manifest then than I found at the earlier period under full influence of atropine. I did not assume this to be acquired hypermetropia, but that the atropine failed to reveal it at the time of life it was used.

DR. RING. — In testing the eyes of those in student life and in young people who use the eyes a great deal, I think it would be observed in quite a number of cases that the refraction does change, that is, that a mildly hypermetropic eye may change through the turnstile of astigmatism to a myopic eye. I happen to be situated so that I see a great many students, and every once in a while I see that condition of things, and I think it is not infrequent that the refraction changes at times within a few years.

MODIFICATION OF THE STEREOSCOPE.

BY RICHARD H. DERBY, M.D.,

NEW YORK CITY.

The usefulness of the stereoscope in the exercise of the ocular muscles has been recognized by many writers. Albrecht Von Graefe used in the ordinary Holmes stereoscope a card, divided by vertical and horizontal lines into regular spaces. Broad-headed brass pins, such as draughtsmen use, were substituted for the half-pictures, and the position of these pins changed according to the needs of the internal and external recti muscles. This device was resorted to constantly after tenotomy and it was an aphorism of Von Graefe that the mathematical proof of a successful squint operation was the establishment of stereoscopic vision. The ingenious cards of Dr. John Green,* the series of Kroll and Perlia,† those of Dahlfeld,‡ and more recently those of Javal,§ all served a like purpose. The Javal cards presented the half-pictures in a series of increasing distance from the middle line, in the interest of faulty convergence or divergence.

* TRANS. AM. OPH. SOCIETY.

† Kroll's Stereoskopische Bilder für Schielende Verlag von Leopold Vass in Hamburg.

‡ Dahlfeld's Bilder für Stereoskopische Ulbungen Verlag Ferdinand Enke, Stuttgart.

§ Manuel de Strabisme. E. Javal, Paris. J. Masson, Editeur.

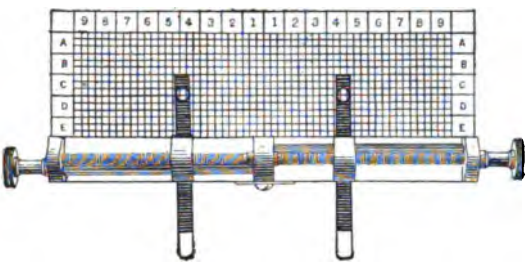
The writer of the present paper long felt the need of some mechanical device, by means of which the half-pictures could be readily displaced upon the surface of a fixed card, and this not alone in a horizontal but in a vertical direction. To attain this end the present instrument was devised, and some description of its earlier form was published in the Transactions of the New York Eye and Ear Infirmary.* Since this publication certain changes have been made, and the author believes that in its present form it possesses advantages over other instruments now in use.

To meet varying pupillary distance, the convex prisms in the eye-piece may be separated or approached by means of a screw, at the will of the patient, frames being provided to carry both spherical and cylindric lenses. The object-card, made of metal, is placed on a firm shaft, and by a screw adjustment may be moved to any required distance from the eyes of the patient. On the back of this card vertical and horizontal lines have been engraved, at a distance of one centimeter, the one from the other. The horizontal interspaces are marked by letters of the alphabet, and the vertical by numbers. Along the lower margin of the object-card an endless screw moves the carrier of the half-pictures in either the lateral or the vertical direction, and its position may be read and recorded through an opening in the back of the carrier on the engraved object-card.

In the case of eyes where there is dynamical equilibrium, the center of the half-pictures is ordinarily 4.5 centimeters each from the middle line, and they are centered on the same horizontal line. Should the patient, in order to obtain stereoscopic vision, turn the screw and place one half-picture higher than the other, insufficiency of superior or inferior rectus or of an oblique muscle is indicated. In the same way, if the half-pictures are approached to a distance of 3.5 cent. or separated to a distance of 5.5 cent., insufficiency of externi or interni respectively may be inferred.

It is, however, not alone as an instrument for the detection of muscular unbalance that the stereoscope has yielded to the

* N. Y. Eye and Ear Infirmary Reports, January, 1898.



Dr. Derby's Modification of the Stereoscope

writer the best results. In orthoptic exercise much advantage may be gained from its use. While it would be too much to claim that with it alone strabismus, either real or dynamical, can alone be relieved, still experience has shown that systematic exercise with it is most advantageous in both classes of cases.

The following notes from the author's case-book illustrate the range of usefulness of the instrument.

(*1*) *Paresis of external rectus.* Mrs. E. D., aged 40. The day before the patient was seen, she awoke with a distressing diplopia. There was a nearly complete paresis of the left external rectus. Refraction normal. With the stereoscope only the closest possible approximation of the half-pictures gave binocular vision, and then only for a moment. Daily stereoscopic exercise was enjoined. The half pictures were gradually brought farther and farther apart until within ten days they could be seen at the normal distance of 4.5 cent. So soon as the paretic externus began to regain its tone, the patient received the series Kroll's cards for use at home and they in turn were gradually mastered. The ordinary period of convalescence seemed here to be materially shortened, and the patient derived much encouragement from the daily gain in muscular power.

(*2*) *Convergent strabismus.* R. G., age 7. The right eye strabismic, to the extent that by fixation of near objects with the left, the inner margin of the cornea stands opposite the punctum lachrymale. There is good central fixation of the squinting eye, which shows a hypermetropic astigmatism of 3 D, and has a vision of .1. The left eye is slightly hypermetropic, and has normal vision. The closest possible approximation of the half-pictures does not give stereoscopic vision. The little patient received a complete correction of the refraction. For a fortnight, daily instillation of atropine was made, and she was directed to exercise the strabismic eye two hours each day, always with the fellow-eye closed. With a Holmes stereoscope, and a special card, having an L and an F, in closest apposition, the patient was soon able to fuse the two letters into an E. Now the exercises with the movable half-pictures were undertaken and a gradual separation of the figures attained in the interest of binocular vision until,

at last, when they were placed each at 4.5 cent. from the middle line the two could for a moment be superimposed. With this daily exercise the vision of the strabismic eye was increased to .4. When last seen the patient could see for the most part all of the Kroll and Dahlfeld cards correctly. While it is not improbable that a tenotomy must yet be made in this case, still, the stereoscopic exercise has made the final result more sure.

(3) *Diplopia, the result of several tenotomies.* Mrs. S. M. C., an artist, age 34. Since the age of ten, myopic. October 7, 1896, an examination showed O D M 4 D. Am .50 D; OS M 4,5 D Am .50 D. Each eye a vision of .9. The patient has recently submitted to four successive tenotomies and has a distressing operative diplopia, which is always present. In reading and at her work she wears O. D. — 4 D, combined with a prism of 5° (base in); O. S. — 4 D, combined with a prism of 4° (base up), but asthenopic symptoms soon occur after any continuous work.

The patient was now directed every morning to use the stereoscope, adjusting the half-pictures both vertically and horizontally, so that they appeared superimposed. After a half-hour of such exercise a record was made of the position of the half-picture.

[In these notes which follow it will be remembered that the letters, A, B, C, etc., indicate the vertical, and the numbers 4, 5, etc., the horizontal, distance of each in centimeters from the middle line.]

The patient wore at these exercises no correcting lenses, either spherical or prismatic.

On October 6th the record was					O. D.	A	O. S.	B	
						4.5		4.5	
"	10th	"	"	"	O. D.	C	O. S.	A	
						6.5		6.5	
"	12th	"	"	"	O. D.	A	O. S.	B	
						4		4.5	
"	20th	"	"	"	O. D.	B	O. S.	B	
						6.5		5	
"	24th	"	"	"	O. D.	B	O. S.	B	
						4		4	
November	7th	"	"	"	O. D.	B	O. S.	B	
						4		4	

This last record, which shows nearly muscular equilibrium, remained unchanged, and the patient received for reading and painting o. u. + 5 O D c (180°). The diplopia was no longer present and the asthenopic symptoms had disappeared.

IN MEMORIAM.

Dr. J. J. B. Vermyne.

Just before the meeting of the Society in 1898 occurred the death of one of its members who had been connected with the Society for a quarter of a century. He was well known to all those who habitually attend the meetings, for in all these twenty-five years he had been absent only twice. He served on the Committee on Bulletin in 1878, and on the Committee on Membership in 1884, 1885, and 1886. In 1878 he read a paper on "Rupture of the Sphincter Pupillae," and he frequently took part in the discussions. Dr. Vermyne was born in a comparatively obscure town in Holland, studied in the universities of his native land, and became a surgeon in the Dutch navy. In his service he was stationed for a time in Surinam, where he married the daughter of a merchant from New Bedford, Mass. Returning to Holland he entered general practice. During the Franco-Prussian War Dr. Vermyne and his wife joined the Red Cross Society, and remained in its service through the war. For his services the French Government gave him the order of the Legion of Honor. Soon after this time he settled in New Bedford, at first in general practice, but soon devoted himself mainly to ophthalmic and aural diseases. In 1873 he was elected to membership in our Society, and two years later he joined the American Otological Society, of which he was soon elected Secretary, which office he held during his lifetime, and so endeared himself to its members that when he insisted that his health would no longer allow him to do the work, they elected an assistant secretary for that purpose, and requested him to withdraw his resignation. Dr. Vermyne was a man of sympathetic nature, and made warm

friends. He had decided opinions and was ready to defend his position stoutly, but never with acrimony. His precision and orderliness was indicated in his handwriting, which was a marvel of legibility. His tastes were those of a cultivated gentleman, and he was specially fond of art and music. He was one of the founders of St. Luke's Hospital, New Bedford, and was one of its officers as long as his health permitted. He died at the age of 63, at his summer residence in Francestown, New Hampshire.

VOL. VIII. — INDEX.

INDEX OF SUBJECTS.

PAGE.

Acoin, a new local anesthetic, by Dr. R. L. Randolph, . . . 544
Accommodation (so-called) in a lensless eye, Dr. J. A. White, . 241
Achromatic glass for cataract for far vision, and a bifocal combination for far and near use, Dr. Wm. Thomson, . . . 120
Angioma of lachrymal gland, Dr. G. E. de Schweinitz, . . . 321
Angio-sarcoma of apparent retinal origin, Dr. W. B. Johnson, . 76
Anomalies of the epithelial layer of the crystalline lens and anterior polar cataract, Dr. A. Alt, ... 478
Alternating current in connection with the Johnson magnet, Dr. W. B. Johnson, ... 570
Buphthalmia — series of cases in same family, Dr. W. B. Johnson, 308
Calcareous (siliquose) cataract, removal of, Dr. H. D. Noyes, . 454
Cassaripe — a new remedy for corneal ulceration, Dr. S. D. Risley, 423
Cataract operations, series of consecutive, Dr. R. L. Randolph, . 126
Chalazion forceps, Dr. C. J. Kipp, ... 471
Cholesterine crystals in opaque lens of child, Dr. L. A. W. Alleman, 142
Chronic membranous conjunctivitis (pathology of), Dr. L. Howe, . 36
Congenitally inefficient external rectus with binocular vision, Dr. J. O. Tansley, ... 503
Cyst of the vitreous, Dr. J. O. Tansley, ... 507
Credè's method for prevention of purulent ophthalmia of infancy in public institutions, Dr. L. Howe, ... 52
Delayed union after cataract extraction, Dr. G. C. Harlan, . . 390
Desirability of a periscopic quality in correcting lenses, Dr. C. M. Culver, ... 119
Diphtheritic conjunctivitis, Dr. Myles Standish, ... 44
Double needle intended to facilitate the discission of secondary cataract, Dr. F. Buller, ... 563
Entropion of lower lid, treatment with caustic potash, Dr. S. Theobald, ... 359
Epicanthus and ptosis (congenital), Dr. R. Sattler, ... 96
Expulsive intra-ocular hemorrhage after preliminary iridectomy for cataract, Dr. R. L. Randolph, ... 522
Exostosis of frontal sinus, Dr. E. Fridenberg, ... 289
Exophthalmos (double) from sarcoma of dura mater, Dr. S. M. Burnett, ... 31
Exophthalmos (pulsating), Dr. W. H. Wilder, ... 23
Exophthalmic goitre following ether anesthesia, Dr. Wm. F. Aiken, ... 20
Exophthalmic goitre — panophthalmitis — enucleation both eyes, Dr. J. A. Spalding, ... 15
Fibro-sarcoma of orbit, Dr. F. M. Wilson, ... 291
Gunshot wounds of eyeball, Dr. C. S. Bull, ... 275
Haab magnet as a sideroscope, Dr. P. A. Callan, ... 456
Hemorrhage attending extraction of cataract, Dr. O. F. Wadsworth, 136

PAGE.

High myopia, remarks on cases of, Dr. H. D. Noyes, ... 330
High myopia, surgical treatment of, Dr. W. H. Wilmer, . . 333
High myopia, surgical treatment of, Dr. R. Sattler, . . . 338
Hypopion-keratitis, Drs. J. Green and A. E. Ewing, . . . 374
Hysterical or functional blindness, Dr. A. A. Hubbell, . . . 200
"Hypermetropia acquisita," Dr. B. A. Randall, ... 583
Impairment of central vision following prolonged use of the affected eye, Dr. S Theobald, ... 198
Implantation of sponge in orbit after enucleation, Dr. S. D. Risley, 411
In memoriam, Dr. J. J. B. Vermyne, ... 591
Intra-ocular enchondroma springing from choroid, Dr. E. Jackson, 72
Interstitial keratitis (congenital), Dr. H. F. Hansell, . . . 371
Ivory exostosis of orbit (supplementary report), Dr. R. Sattler, . 70
Ivory exostosis of orbit, Dr. W. F. Norris, ... 67
Kerato-conus, surgical treatment of, Dr. R. Sattler, . . . 341
Law of refraction — change following changes in body-weight, Dr. C. M. Gould, ... 115
Learning to see at forty, first with one eye and then with both, Dr. J. L. Minor, ... 460
Leuco-sarcoma of choroid, Dr. G. E. de Schweinitz, . . . 318
Lipoma of orbit, Dr. E. Gruening, ... 294
Lymphoma of lids, Dr. M. Standish, ... 364
Magnetic extraction of steel from the eyeball through the point of entrance, report of three cases, Dr. W. B. Johnson, . . 571
Metastatic panophthalmitis, Dr. B. L. Millikin, ... 535
Multiple rupture of the pupillary border of the iris, with subsequent development of myopic astigmatism, Dr. W. F. Mittendorf, 541
Melano-sarcoma of conjunctiva and cornea of long duration, Drs. J. Green and A. E. Ewing, ... 468
Metastatic carcinoma of choroid, Dr. G. E. de Schweinitz, . . 313
Modification of the stereoscope, Dr. R. H. Derby, ... 587
Operations for secondary cataract, Dr. H. Knapp, ... 297
Ophthalmic changes in chlorosis, pernicious anæmia, and leuco-cythæmia, Dr. C. A. Oliver, ... 212
Optic nerve atrophy following sexual excesses, Dr. J. A. Spalding, 206
Perimeter, a modified, Dr. C. H. Williams, ... 567
Position of eyeball during Listing rotation, Dr. G. Hay, . . . 414
Premature delivery to preserve sight (two cases), Dr. A. E. Adams, 430
Primary tumor of the optic nerve, Dr. F Buller, ... 510
Primary non-pigmented sarcoma of the upper lid, Dr. C. A. Veasey, 519
Primary carcinoma of the caruncle, Dr. G. E. de Schweinitz, . . 324
Proportion of blind in cities less than in country, Dr. L. Howe, . 259
Protargol as antiseptic in operations on eyeball, Dr. B. E. Fryer, . 402
Prothesis in cases of cicatricial orbit, Dr. G. C. Harlan, . . 63
Ptosis (new operation for). Dr. W. H. Wilder, ... 99
Purulent ophthalmia of infancy — *majority* report of Committee on Resolutions relating to, ... 265
Minority report, ... 268
Pupillary reaction, clinical measurements of, Dr. L. Howe, . . 577
Quinine blindness, pathology of, experimental, Dr. W. A. Holden, 405
Reflecting phorometer, and a discussion of the possibilities concerning torsion of the eyes, Dr. F. H. Verhoeff, . . . 490
Refraction, change in cases of glycosuria, Dr. S. D. Risley, . . 121
Removal of steel from vitreous, the position of the foreign body being determined by a scotoma in field of vision, Dr. C. A. Oliver, ... 154

PAGE.
Removal of steel, located by X rays, from eyeball, Dr. Wm. Thomson, 93
Removal of iron imbedded in crystalline lens, Dr. Wm. Thomson, 83
Retinitis albuminurica as a factor in the causation of secondary glaucoma, Dr. C. S. Bull, ... 526
Retinitis circinata, Dr. E. Fridenberg, ... 181
Retinitis proliferans, Dr. J. E. Weeks, ... 158
Resection and advancement of levator palpebræ muscle in traumatic ptosis, Dr. C. A. Oliver, ... 103
Rœntgen ray for determining location of foreign bodies in the eyeball, Dr. C. A. Oliver, ... 90
Sarcoma of conjunctiva and cornea, Dr. S. B. St. John, ... 369
Spontaneous expulsion of foreign body from anterior chamber, Dr. J. P. Worrell, ... 386
Spontaneous rupture of the eyeball, Dr. B. L. Millikin, ... 488
Standards of form and color vision required in railway service, Dr. C. H. Williams, ... 227
Sympathetic ophthalmia caused by glioma-retinæ, Dr. A. Alt, . 485
Sympathetic inflammation from adhesion of eyelid to stump, Dr. T. Y. Sutphen, ... 428
Sympathetic Neuro-retinitis, Dr. J. P. Worrell, ... 452
Taxis in increased intra-ocular tension, Dr. S. O. Richey, . . 156
Tests for vision, color-sense, and hearing, Dr. C. H. Williams, . 547
Toxic amblyopia, Dr. G. E. de Schweinitz, ... 186
Trophic keratitis, Dr. G. C. Harlan, ... 107
Tubercular growth in region of lachrymal sac, Dr. G. E. de Schweinitz, ... 327
Tumors of orbit, eyelids, and vicinity, Dr. C. S. Bull, ... 281
Tumor of inter-vaginal space (completion of history of), Dr. S. M. Burnett, ... 185
Unilateral winking as a test of comparative visual acuity, Dr. W. Rider, ... 434

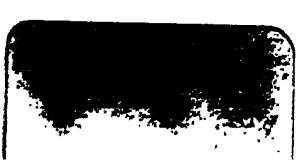
INDEX OF AUTHORS.

Dr. A. E. Adams. Premature delivery to preserve sight (two cases), 430
Dr. William F. Aiken. Exophthalmic goitre following ether anesthesia, ... 20
Dr. L. A. W. Alleman. Cholesterine crystals in opaque lens of child, ... 142
Dr. A. Alt. Anomalies of the epithelial layer of the crystalline lens and anterior polar cataract, ... 478
Sympathic ophthalmia caused by glioma-retinae, ... 485
Dr. C. S. Bull. Gunshot wounds of eyeball, ... 275
Retinitis albuminurica as a factor in causation of secondary glaucoma, ... 526
Tumors of orbit, eyelids and vicinity, ... 281
Dr. F. Buller. Double needle intended to facilitate the discission of secondary cataract, ... 563
Primary tumor of optic nerve, ... 510
Dr. S. M. Burnett. Exophthalmos (double) from sarcoma of dura mater, ... 31
Tumor of inter-vaginal space (completion of history of), . 185
Dr. P. A. Callan. Haab magnet as a sideroscope, ... 456
Dr. C. M. Culver. Desirability of a periscopic quality in correcting lenses, ... 119

PAGE.

Dr. E. Fridenberg. Exostosis of frontal sinus, ... 289
Retinitis circinata, ... 181
Dr. B. E. Fryer. Protargol as antiseptic in operations on eyeball, 402
Dr. C. M. Gould. Law of refraction, change following changes in body weight, ... 115
Drs. J. Green and A. E. Ewing. Hypopion keratitis, . . . 374
Melano-sarcoma of conjunctiva and cornea, ... 468
Dr. E. Gruening. Lipoma of orbit, ... 294
Dr. H. F. Hansell. Interstitial keratitis (congenital), . . . 371
Dr. G. C. Harlan. Delayed union after cataract extraction, . . 390
Prothesis in cases of cicatricial orbit, ... 63
Trophic keratitis, ... 107
Dr. G. Hay. Position of eyeball during Listing rotation, . . 414
Dr. W. A. Holden. Quinine blindness, pathology of, experimental, 405
Dr. L. Howe. Chronic membranous conjunctivitis, pathology of, . 36
Credè's method for prevention of purulent ophthalmia of infancy in public institutions, ... 52
Proportion of blind in cities less than in country, . . 259
Pupilary reaction, clinical measurements of, . . . 577
Dr. A. A. Hubbell. Hysterical or functional blindness, . . 200
Dr. E. Jackson. Intra-ocular enchondroma springing from choroid, 72
Dr. W. B. Johnson. Angio-sarcoma of apparent retinal origin, . 76
Alternating current in connection with the Johnson magnet, 570
Magnetic extraction of steel from eyeball through point of entrance, three cases, ... 571
Dr. C. J. Kipp. Chalazion forceps, ... 471
Dr. H. Knapp. Operations for secondary cataract, . . . 297
Dr. B. L. Millikin. Metastatic panophthalmitis, ... 535
Spontaneous rupture of eyeball, ... 488
Dr. J. L. Minor. Learning to see at forty, first with one eye, and then with both, ... 460
Dr. W. F. Mittendorf. Multiple rupture of pupilary margin of iris, with subsequent development of myopic astigmatism, . 541
Dr. W. F. Norris. Ivory exostosis of orbit, ... 67
Dr. H. D. Noyes. Calcareous (siliquose), cataract, removal of, . 454
High Myopia, remarks on cases of, ... 330
Dr. C. A. Oliver. Ophthalmic changes in chlorosis, pernicious anæmia and leucocythæmia, ... 212
Removal of steel from vitreous, the position of the foreign body being determined by a scotoma in the field of vision, 154
Roentgen rays for determining location of foreign bodies in eyeball, ... 90
Dr. B. A. Randall. Hypermetropia acquisita, ... 583
Dr. R. L. Randolph. Acoin, a new local anesthetic, . . . 544
Cataract operations, series of consecutive, ... 126
Expulsive intra-ocular hemorrhage after preliminary iridectomy for cataract, ... 522
Dr. S. O. Richey. Taxis in increased intra-ocular tension, . . 156
Dr. W. Rider. Unilateral winking as a test of comparative visual acuity, ... 434
Dr. S. D. Risley. Cassaripe, a new remedy for corneal ulceration, 423
Implantation of sponge in orbit after enucleation, . . 411
Refraction-change in cases of Glycosuria, ... 121
Dr. S. B. St. John. Sarcoma of conjunctiva and cornea, . . 369

PAGE.

Dr. R. Sattler. Epicanthus and Ptosis (congenital), . . . 96
High myopia, surgical treatment of, ... 338
Ivory exostosis of orbit (supplementary report), . . . 70
Kerato-conus, surgical treatment of, ... 341
Dr. G. E. de Schweinitz. Angioma of lachrymal gland, . . 321
Leuco-sarcoma of choroid, ... 318
Metastatic carcinoma of choroid, ... 313
Primary carcinoma of the caruncle, ... 324
Toxic amblyopia, ... 186
Tubercular growth in region of lachrymal sac, . . . 327
Dr. J. A. Spalding. Exophthalmic goitre, panophthalmitis, double enucleation, ... 15
Optic nerve atrophy following sexual excesses, . . . 206
Dr. Myles Standish. Diptheritic conjunctivitis, ... 44
Lymphoma of lids, ... 364
Dr. T. Y. Sutphen. Sympathetic inflammation from adhesion of eyelid to stump, ... 428
Dr. J. O. Tansley. Congenitally inefficient external rectus with binocular vision, ... 503
Cyst of vitreous, ... 507
Dr. S. Theobald. Entropion of lower lid treated with caustic potash, ... 359
Impairment of central vision following prolonged use of the affected eye, ... 198
Dr. Wm. Thomson. Achromatic glass for cataract for far vision and a bifocal combination for far and near use, . . 120
Removal of steel, located by X-rays, from eyeball, . . 93
Removal of iron imbedded in crystalline lens, . . . 83
Dr. C. A. Veasey. Primary non-pigmented sarcoma of lid, . . 519
Dr. F. H. Verhoeff. Reflecting phorometer and discussion of the possibilities concerning torsion of the eyes, . . . 490
Dr. O. F. Wadsworth. Hemorrhage attending extraction of cataract, ... 136
Dr. J. E. Weeks. Retinitis proliferans, ... 158
Dr. W. H. Wilder. Exophthalmos (pulsating), ... 23
Ptosis, new operation for, ... 99
Dr. C. H. Williams. Standards of form- and color-vision required in railway service, ... 227
Tests for vision, color-sense, and hearing, ... 547
Dr. W. H. Wilmer. High myopia, surgical treatment of, . . 333
Dr. F. M. Wilson. Fibro-sarcoma of orbit, ... 291
Dr. J. P. Worrell. Spontaneous expulsion of foreign body from anterior chamber, ... 386
Sympathetic neuro-retinitis, ... 452
In Memoriam — Dr. J. J. B. Vermyne, ... 591

41
22